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ABSTRACT

This collection of reports on curricular structure and change in North American medical education covers almost all of the accredited medical schools in the United States and Canada (118 of the 125 in the United States and 12 of the 16 in Canada). The reports have the same basic structure so that information can be more readily compared, and they emphasize process and change rather than quantitative data. These sections provide information about each school: (1) curriculum management and governance structure; (2) office of education; (3) budget to support educational programs; (4) valuing teaching; (5) curriculum renewal process; (6) learning outcomes; (7) changes in pedagogy; (8) application of computer technology; (9) changes in assessment; and (10) clinical experiences. These profiles provide a picture of the profound changes that have occurred and are occurring in U.S. medical education. An appendix contains a glossary. (SLD)

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A Snapshot of Medical Students' Education at the Beginning of the 21st Century: Reports from 130 Schools

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Editor and Compiler
M. Brownell Anderson

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ACADEMIC MEDICINE

THE JOURNAL OF THE ASSOCIATION OF AMERICAN MEDICAL COLLEGES
SEPTEMBER 2000, VOLUME 75, NUMBER NINE SUPPLEMENT

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Foreword

The scale of the *Snapshot* project was daunting from the beginning. The earliest discussions made clear that the supplement would require unusually complex planning and scheduling. And it would be four times larger than our usual supplements. My early discussions with Brownie Anderson had convinced me, however, that a successful *Snapshot* supplement would be a major contribution and therefore well worth the effort.

Snapshot is an unprecedented collection of reports on curricular structure and change in North American medical education. First, it covers almost all of the accredited medical schools in the United States and in Canada (118 of the 125 in the United States and 12 of the 16 in Canada). Second, the reports have the same basic structure, so that the information can be more readily compared institution to institution. Third, they emphasize process and change rather than quantitative data. Fourth, the information was collected and distilled by a uniquely knowledgeable person.

The last time that such a complete picture of U.S. medical education was presented was when Abraham Flexner published the results of his famous survey in 1910. His work is often misunderstood—Flexner did not undertake a dispassionate survey and afterwards make recommendations for reform. Instead, he had a strong agenda of promoting the path of reform already under way at some institutions, and he surveyed U.S. medical schools as a way to highlight the differences between the good schools, the ordinary schools, and the disgracefully bad ones. His report was so successful that the reform movement is associated with him, even though it predated him.

Decades later, when the Flexnerian curriculum in its turn needed reform, again the changes were introduced piecemeal, at different speeds, in different surroundings and with widely different outcomes. Despite the commonalities brought about by accreditation and licensure standards, there is great and stimulating variety of educational approaches in our medical schools. However, the variety is difficult to comprehend. This time, unlike 1910, we do not need to know the number of hours that students study particular subjects or whether schools have entrance requirements. Instead, we need to understand the structures of curriculum governance and administration, the approach to curriculum organization, the philosophy of teaching and learning as expressed in the curriculum. The *Snapshot* collection gives us that.

The collection can be used as a reference, to find information about a particular school or about an aspect of the medical curriculum across schools or about an innovation. It gives a general mile marker for how curricula are organized and governed. Most important, it may allow us to create schema, rather than only rank orders, of medical education programs and thus to better understand the structures and systems that can best educate physicians.

Addeane S. Caelleigh

A Guide to the 130 Reports in This *Snapshot* Supplement to *Academic Medicine*

“Medical schools haven't changed since the Flexner report of 1910.” In the past ten years, I have heard a variety of individuals say this, including leaders of academic medicine and legislators, and have read it in the press on many occasions. Fortunately, that statement, whether spoken, written, or implied, is incorrect. It reflects a lack of information about just how fundamentally U.S. and Canadian medical schools have reformed what they teach and how they teach it, especially in the last decade, and how this process of change is continuing. I am aware of what the schools are doing because my work brings me into almost daily contact with the many medical school faculty and administrators who are working diligently to find the best ways to prepare physicians to practice medicine in the 21st century. But I am fortunate; until recently, most people did not have an easy way to learn what medical schools have done and are doing to revise their educational programs. That is no longer the case, thanks to the collection of reports you now hold in your hands, which together create a panoramic “snapshot” of medical students' education at the beginning of the 21st century.

It is true that medical schools have long needed to make changes in the ways they educate their students. There have been numerous reports about medical education and recommendations for change over the past 20 years: the *GPEP Report* and the *ACME–TRI Report* from the Association of American Medical Colleges (AAMC),[1,2] reports from the Josiah Macy, Jr. Foundation such as *The New Biology and Medical Education*[3] and *Adapting Clinical Medical Education to the Needs of Today and Tomorrow*,[4] the American Medical Association's *Future Directions for Medical Education*,[5] and publications issued by the Hastings Center,[6] by a group of medical educators in Canada,[7] and by the General Medical Council of Great Britain[8] represent only a few of these. Many of the reforms now taking place have built on the recommendations published in these and other reports.

In 1996, the AAMC launched the Medical School Objectives Project (MSOP) to assist medical schools in their efforts to revise their educational programs to improve the quality of medical students' education and to produce physicians who can meet the changing needs of society and of the health care environment. The Project has published four reports to date,[9–12] and AAMC staff are working with medical schools on implementing changes based on criteria and guidelines in these reports.

How This Supplement Came to Be

The strong response to the MSOP reports made even clearer to me and my colleagues that many changes have been made, in the past decade especially, or are under way in medical students' education. In most cases, these changes have occurred without a major influx of money or additional resources and are dependent on the commitment and hard work of a dedicated group of faculty and administrators, responsive to societal needs. I and others felt that persons inside and outside academic medicine would benefit from knowing about these many changes, which amount to a quiet revolution in curricular reform. Hence, the idea for this collection of reports was born.

Jordan J. Cohen, MD, president of the Association, Michael E. Whitcomb, MD, senior vice president, Division of Medical Education at the Association, and the editors of *Academic Medicine* have supported this idea from the beginning, and the editors, both at the Association and at the journal's publishing house in Philadelphia, have been of inestimable help in every aspect of making the idea a reality. Once the editors determined that we could produce a supplement in excess of 400 pages, and Dr. Cohen agreed to support the costs of the publication, the work began.

First, a letter was sent from Dr. Cohen to all U.S. and Canadian medical school deans and the associate deans for academic affairs asking them to answer a set of questions about their schools' educational programs. I used the question format rather than a more open-ended one because I wanted to have the same types of information about all medical schools. I took this approach partly because we had to limit the length of each school's published responses in this supplement. In addition, I thought it would be more useful to compare and contrast the schools if their responses were presented in a similar manner. That is why all the schools' responses are presented within sets of identical (in most cases) categories—e.g., "Learning Outcomes"—that reflect the topics covered by the questions sent to the schools.

The time we had to accomplish our task was short, but the response of the schools was gratifying and even a bit overwhelming. This supplement presents my compilations of the answers to my questions by representatives of 130 of the 141 accredited allopathic medical schools in the United States and Canada. This kind of information about every medical school's educational program has never been collected in a single place before. I call these "snapshots" because, like camera snapshots, they reveal considerable information about each school at a particular point in time, but there is more that could be said in each case. I have often said that when you have seen one medical school, you have seen one medical school, and I believe the 131 snapshots in this supplement support my contention. Even so, the entries taken together form a three-dimensional mega-snapshot of the tremendous breadth, richness, and diversity of North America's medical school programs.

How the Schools' Responses Are Organized

As you read through these pages, you will find that the schools took different approaches to responding to the questions. I tried to include most of what the schools sent, but it was necessary to edit in every case in order to fit the schools' responses to the bulleted format and the main categories that organize each report's information. Some of the schools chose to focus exclusively on their curricular reform activities and did not include information for all the categories.

Short explanations of what these categories mean and highlights from the reports are summarized below. I also developed a glossary of terms used throughout the reports, which can be found at the end of this supplement.

Curriculum Management and Governance Structure

Each school was asked to provide an overview of the governance of its curriculum and how it is managed. Many of the schools have centralized the governance of the curriculum in an executive committee that has oversight responsibility for all aspects of the curriculum. Components of the curriculum, and sometimes the various years of the curriculum, have their own committees, which report to the central governing committee. Usually, the associate dean for academic affairs (or curriculum, or education—the titles vary considerably) has ultimate responsibility for the management and implementation of the medical students' educational program.

The role of the dean and his or her involvement in support of the educational program is highlighted throughout the schools' responses. In every case where curricular reform has been successful and is sustained, the dean has played a key role in supporting the reform, and has typically given authority to an associate dean to assure that the goals of the curriculum are met.

Office of Education

One of the changes that I have become aware of in the past decade is an increase in the numbers of offices or departments at medical schools whose mission is to support the educational program. The responses from the schools supported my observation: 111 of the schools that responded have an office, with funds, devoted to support of the educational program. Some of the offices of education have been in place since the 1970s, but their responsibilities have changed and increased. Since 1990, 65 new offices or positions for a person with responsibility for the educational program have been added.

Budget to Support Educational Programs

An important strategy that the 1993 ACME–*TRI Report* proposed was that "a medical school must have a specific budget for its program for medical students' education."[2,p.S41] With resources for medical schools diminishing and the growing demand on the faculty to devote more time to generating clinical revenue and research dollars, I wanted to find out how many schools had a clear source of funding or a line item in the budget to support the educational program, and what the sources of funding were. While there are more schools that have defined budgets for their educational programs now than was the case in the early 1990s, there is still a long way to go before all schools can say that their educational missions are supported by their own budgets. (The AAMC has initiated a "mission-based budgeting" program to assist schools to align their educational, research, and patient care missions with their budgets and sources of revenue.)

Valuing Teaching

A major barrier to change identified in the ACME–*TRI Report* was a lack of incentive for faculty to teach. An essay at the conclusion of that report suggests that the faculty are committed, dedicated people who want to teach, but who

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perceive that the academic medicine culture does not give students' education a high priority. If you read the mission statement of almost any medical school represented in this supplement, the mission is to educate physicians for the safe and ethical practice of medicine. Yet the people charged to provide the education are often overlooked in promotion and tenure. I deliberately chose the words "valuing teaching" because that is what is necessary if the role of the faculty member is to change in medical schools. The responses from the schools indicate that there are many awards given for excellence in teaching and resources devoted to faculty development efforts to promote teaching. This change is positive. Even so, there is room for the academic societies and faculty members themselves to place a higher value on the activities of teaching. These activities include serving on admission and curriculum committees; writing articles for publication in journals such as *Academic Medicine* and *Medical Education* that would receive as much attention from the promotion and tenure committees as would articles written for scientific publications; presenting papers at conferences that are devoted to medical education rather than to the faculty members' disciplines; and having such a presentation "count" on the faculty member's curriculum vitae.

At least two of the schools whose reports are in this supplement have developed academies to support excellence in teaching (the University of Illinois at Chicago College of Medicine and the University of California, San Francisco, School of Medicine), which may serve as models for other schools. Some schools have developed tenure tracks for clinician–educators, to allow faculty to receive promotion and tenure for their work in education.

Curriculum Renewal Process

This category of each school's report, and the categories that follow it, illustrate the significant changes that the school has made in its educational program. Perhaps even more important, the schools' combined information in this category demonstrates that medical schools' curricula are constantly undergoing change and revision. Medical schools seldom say, "We have finished our curricular reform," but instead have developed processes for continued curricular renewal.

Learning Outcomes

A survey conducted in 1996, at the start of the preparation for the MSOP reports, revealed that fewer than 18% of U.S. and Canadian medical schools had sets of outcomes for their medical school graduates that had been developed and agreed upon by the faculty. In this supplement, the responses of the schools presented in the Learning Outcomes category suggest that many more schools have developed sets of objectives or outcomes for their graduates since 1996. Space limitations prevented publication of all the objectives that were included with the schools' responses, but in every case where the authors included the objectives, there is a note to the reader that a copy of the objectives is available from the authors.

The learning outcomes range from explicit objectives for each course to broad outcomes for graduation. Often the schools indicate they have used the attributes and objectives presented in the first MSOP report as a blueprint for developing the outcomes for their graduates. Though not every school had objectives available to include with its report, in most cases, the authors indicate that work is under way to develop learning outcomes for the educational program.

Changes in Pedagogy

Perhaps the area in which the greatest changes are taking place is pedagogy: the reports in this supplement show that medical schools are using a wide variety of approaches to educate physicians. The methods used, the sites where the education occurs, and the technology used have all, to greater or lesser degrees, changed in the past decade. There has been a shift from faculty-centered to student-centered learning, with an increase in small groups, discussions, tutorials, and students' use of the library to discover information for themselves, rather than obtaining it through lectures only. There is an increased emphasis on students' developing good communication skills and dealing with difficult ethical issues during medical school. There also is more use of standardized patients, and students have contact much earlier with real patients—often in the first week of their first year of medical school. Some schools have developed longitudinal components of the curriculum that allow a student to follow a panel of patients, or a family, from the time the student enters medical school until he or she graduates. Students are exposed to more activities in the community, and the emphasis is on understanding patients in the context of their environments, not just as isolated individuals who present with illnesses.

Application of Computer Technology

If there is a single area that represents the greatest change in the way physicians are preparing to enter practice in the 21st century, it is in the application of computer technology to almost every aspect of their education. Forty-five of the 130 responding schools require students to have their own computers upon admission to medical school. For those schools that do not require students to own computers, there are computer facilities available 24 hours a day for the students.

Course syllabi, textbooks, class notes, histology slides, patient cases, even examinations are delivered via the computer. Several schools report that significant amounts of the communication between faculty and students use electronic mail. Many faculty have developed software used in their courses. Computers are used to teach evidence-based medicine, and to search the literature; the importance of the library has increased with the use of the computer. The Internet is used in self-directed learning and research activities. There are few areas of medical students' education that have not been affected by the applications of computer technology.

Changes in Assessment

The schools' reports in this supplement indicate numerous changes in the ways students' learning and performance are assessed. The assessment methods used are more closely aligned with the principles being taught than was true in years past. Actual people (standardized patients) are used to teach and assess physical examination skills and history taking. Standardized patients play a critical role in assessing noncognitive skills such as communication with the patient. Some schools use peer assessment as a means of determining students' attributes and abilities. A total of 107 of the responding schools reported using objective structured clinical examinations (OSCEs) as a means of assessing students' clinical skills. Often standardized patients are part of that assessment process. As noted earlier, the computer is used for the delivery of many examinations.

The role of faculty observation in assessment and in comprehensive examinations was noted by many schools, though it was acknowledged that, due to competing demands on the faculty, such observation could be intermittent.

Clinical Experiences

Overall, clinical experiences now occur earlier in students' medical education than was true even a few years ago. The authors of several of this supplement's reports indicate that students see patients as early as the first week of the first year of medical school. In others, students are assigned to a patient or a family in their first year and follow these patients through their four years of medical school as part of a longitudinal experience. While teaching hospitals are critical to the clinical education of students, much of the clinical education now occurs outside the hospital wards and takes place in clinics and physicians' offices. The role of the community physician as a preceptor for students' experiences has increased and changed in the past decade.

As part of their clinical education, students are exposed to managed care settings, nursing homes, and hospices; even prisons have become a site for medical education.

Students have begun their own community clinical activities in some schools. Homeless shelters and free clinics are sites of some important clinical education and reinforce the human side of medicine. Because there is increasing demand from society for physicians to have better communication skills, students are being exposed to more opportunities to learn such skills, to deliver "bad news" in the best way, and to attend to the whole person in their clinical experiences. These experiences often are facilitated by standardized patients trained to serve as both patient and teacher for the students.

More than in the past, students' clinical experiences expose them to aspects of health care that reflect the needs of society and the issues these students will encounter when they are physicians. These issues include those of domestic violence, medical ethics, death and dying, communicating effectively with people from different cultures, making decisions about patients who have no money to pay for urgent medical care, working in teams, getting practical experience in managed care, and treating the homeless.

Meeting the Needs of the New Century

In the above paragraphs I have given only highlights of some of the profound changes that have occurred and are occurring in medical students' education today, as described in more detail in the accompanying reports. These reports clearly show that the medical education process is robust and constantly remaking itself to meet the changing needs of our society and the health care environment. The medical schools of North America have groups of incredibly dedicated faculty and community physicians willing to make the reforms that are needed to successfully educate students for practice in the twenty-first century. Perhaps we will revisit the schools in five years to see how much more they have changed.

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The Reports

University of Alabama School of Medicine

Dennis W. Boulware, MD, and William B. Deal, MD

Curriculum Management and Governance Structure

- The Medical Educational Committee, comprised of faculty, student, administrative *ex officio* members and support staff, governs the undergraduate medical education program.
- The committee has primary responsibility for:
    - Design of the overall curriculum
    - Oversight of courses and clerkships
    - Monitoring of program implementation
    - Assessment of students, faculty
    - Evaluation of programs
- Since 1994, a vice chair has been selected every two years; the final selection alternates between a basic and clinical science faculty member. The vice chair serves for two years, advances to chair, and is past chair for two years. The leadership commitment for the committee totals six years.
- There are five working subcommittees of the Medical Education Committee:
    - Assessment Subcommittee
    - Integrated Medical Sciences I Subcommittee (responsible for years one and two)
    - Integrated Medical Sciences II Subcommittee (responsible for years three and four)
    - Informatics and Instructional Methods Subcommittee
    - Integrated Problem-solving Subcommittee

Office of Education

- In 1996 the former Office of Educational Development was transformed into the Office of Curriculum Development and Management.
- The change in name and refocus of activity occurred in response to the emphasis on medical student education at the school.
- New faculty members and resources have been added to the office.

Budget to Support Educational Programs

- Historically, the School of Medicine budget was not categorized and aligned with the various missions of the school.
- In 1994, an effort was made to identify a portion of the budget for medical student education, including direct funding to departments for their educational efforts and their administrative needs to support medical student education programs.
- Funding for medical student education comes from the dean's office, using state appropriations and tuition income.
- Departmental teaching contributions for all four years of medical school are tracked.
- Funds distributed to departments are allocated by the relative effort of each department toward the mission of teaching medical students; efforts are under way to link funds based on quality of teaching.
- Additional funds are set aside on a competitive basis for innovative educational programs within the medical center (i.e., awards to fund computer-based instruction and assessment of medical students).
- Funds used for competitive awards are derived from an endowment generated by the clinical practice plan fund.

Valuing Teaching

- During the 1990s promotion and tenure requirements were modified to reflect the importance of and emphasis on faculty teaching.
- Several departments have incorporated teaching portfolios to capture, quantify, and assess the level of teaching for faculty members considered for promotion and/or tenure.
- In 1995 students were encouraged to create the Argus Society, which is comprised of the entire student body and presents awards to deserving faculty, clerkships, courses, and departments at the annual award ceremony.
- Current efforts are under consideration for faculty peer-reviewed awards.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In 1996, the Medical Education Committee created a list of clinical competencies essential for all graduates of the

School of Medicine. Every medical student receives these upon entry, and the competencies provide the basis for the senior OSCE, which must be passed as a graduation requirement. (The list of competencies is available from the author.)

- ◆ The list of competencies was developed through a laborious process of requesting competencies from clinicians, clerkship directors, and residency program directors; these were then reviewed, cross-referenced and finally agreed to by faculty.
- ◆ A similar project for the basic sciences has been considered but not initiated.

Changes in Pedagogy

- ◆ Integration of clinical and basic sciences is emphasized in classroom experiences, as are small-group learning exercises.
- ◆ The clinical gross anatomy course has been converted from a completely lecture and laboratory course to a case-based small-group discussion experience linked to laboratory exercises.
- ◆ Standardized patients were introduced in 1993 primarily in the development of the senior OSCE.
- ◆ In 1995, the Introduction to Clinical Medicine (ICM) course began to use standardized patients for teaching and assessment in the first and second years.

Application of Computer Technology

- ◆ In 1999 a policy was implemented requiring every entering medical student to own or have access to a personal computer.
- ◆ Early in the decade, there was no medical student computer lab facility or any true computer-based instruction for medical students; now virtually every course and clerkship uses computer-based instruction in its programs.
- ◆ A medical student computer facility was constructed to provide over 70 desktop stations.

Changes in Assessment

- ◆ Prior to 1990, the educational program relied heavily on traditional multiple-choice question (MCQ) examinations and on clinical preceptors' subjective assessments of students.
- ◆ The MCQ format is still used, but the clinical preceptor evaluation is now a standardized template that provides more valid and reliable assessments than previously.
- ◆ Courses have added assessment of small-group participation and student presentations.
- ◆ Standardized patients have been incorporated into the assessment of all second-year and fourth-year students' clinical skills.
- ◆ All second-year students must successfully complete an OSCE on basic physical examination techniques in order to matriculate to the third year.
- ◆ Computerized testing has been implemented since 1997 in first- and second-year courses and is now a consideration for all courses in the first two years.

Clinical Experiences

- ◆ Medical students participate in experiences in intensive care units, operating suites, the emergency department, hospital wards, ambulatory clinics, a continuity clinic, and community-based clinics, and in rural medicine experiences where they live in a rural environment and in clinics for the homeless.

Curriculum Review Process

- ◆ In 1994, the school initiated its Project Curriculum 2000 plan. The project, begun as a team-building exercise, included the following elements:
  - Soliciting input from all levels of faculty, students, and staff.
  - Reviewing all curriculum objectives, internal examinations, NBME subject examination performance, residency selection/matching, and student evaluations. (*There was not room to print the list of these subjects of review, but it is available from the author.*)
  - Defining a vision, mission, and goals for the curriculum.
  - Defining a curriculum that would meet the vision, mission, and goals identified.
- ◆ The vision established that the school desires to achieve for the medical student education program the level of recognition that is enjoyed by research and clinical care missions.
- ◆ Four major goals were identified for graduates of the school:
  - They would possess habits of lifelong learning, providing the flexibility to build upon their knowledge, skills, and professionalism.

  - They would possess the ability to work within and lead future health care systems.
  - They would possess the ability to discover and disseminate new knowledge.
  - They would reflect the population and composition of Alabama.
- Several working groups of faculty were created to review the curriculum and educational outcomes as it related to the four major goals.
- The final report of the working groups resulted in additional task forces' being assigned to create a new curriculum—this process is in progress.
- Faculty recognize that curriculum renewal is evolutionary and requires long-term, vigilant oversight.

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University of South Alabama College of Medicine

Betsy D. Bennett, MD, PhD

Curriculum Management and Governance Structure

- The governance and management of the educational program is delegated by the dean of the college of medicine to the vice dean for student affairs and medical education and through the vice dean's office to various college of medicine committees.
- The committees that are most heavily and directly involved in the educational program are the admission committee, the curriculum committee, and the Student Promotion and Evaluation Committee (SPEC). The vice dean serves as an ex-officio member of the latter two committees and currently chairs the Admission Committee.
- Each committee is composed of faculty representing virtually all departments in the college of medicine.
- Students from the second, third, and fourth years serve on the curriculum and SPEC committees and senior students serve on the admission committee. Students are full voting members of these committees.
- The Office of Admissions, which had been run directly out of the dean's office, has been brought under the vice dean, as has continuing medical education.
- The vice dean was given responsibility for supervising graduate medical education and serves as liaison between the college of medicine academic departments, which are responsible for the educational aspects of residency training, and the University of South Alabama Hospitals and Clinics, which employ the residents.

Office of Education

- The Office of Student Affairs and Medical Education was established in February 1999. This office is not an office of education in the sense of providing direct instruction and/or faculty development in educational methods or theory.
- The office is responsible for oversight of all educational activities in the college of medicine from admissions through continuing medical education. This is a new concept, and the office's initial year has been spent working out procedures that allow it to operate throughout the continuum of educational practice, integrate educational activities where feasible, and maintain the strong level of support for student affairs that is traditional at the school.
- The office plans to be involved in faculty development, but activity in this areas has been limited to date. The office has guaranteed support for a faculty development initiative sponsored by the Department of Medicine.

Budget to Support Educational Programs

- The Office of Student Affairs and Medical Education has a defined budget that is used in support of various educational and operational concerns at all levels. These monies are used for projects initiated through the vice dean and do not directly support departmental educational activities for faculty, students, or residents.
- Departmental educational activities typically are supported through departmental budgets and may be supplemented by money from the dean's office.
- The vice dean's budget (supplemented from the dean's office as necessary) is used for college-wide activities, such as an annual curriculum retreat, and for specific interdepartmental efforts.

Valuing Teaching

- The course directors for all required courses are appointed by the chairs of the various departments. Some departments rotate the course director position every year or two while others retain the same person in that position for an indefinite period of time. The selection of the course director is based on both interest and demonstrated ability to handle the educational and administrative aspects of the course.
- Elective courses for senior students are usually initiated by individual faculty with the approval of the chair.
- Course directors are evaluated by students with regard to their teaching ability as well as the organization and efficiency with which the course is administered. This information as well as the chair's impression of the same areas is used in the chair's annual evaluation of the faculty member.
- Faculty are recognized for their teaching efforts in several

ways. Student recognition comes in the form of annual awards given by the fourth-year class for best basic and clinical science professor and the best basic and clinical science course.

- Teaching responsibilities and abilities are an integral part of the promotion and tenure criteria and carry equal weight with other criteria.
- The college of medicine is currently working on an incentive plan for clinical faculty in which teaching responsibilities will also play a major role.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Each department is responsible for developing goals and objectives for medical student courses, both required and elective.
- The curriculum committee is in the process of reviewing these objectives and recommending revision where needed.
- All students must demonstrate satisfactory mastery of these objectives in order to pass the course. So, in a sense, these goals and objectives represent outcomes that must be satisfied prior to graduation.
- One of the goals of the curriculum committee for the 1999–2000 academic year is the development of a written procedure for assessment and documentation of clinical skills prior to graduation. A subcommittee has been charged with this responsibility and is in the process of determining the specific skills that should be included in this assessment and recommending a procedure for their evaluation.

Changes in Pedagogy

- The basic science departments are encouraged, but not required, to use small-group learning experiences wherever possible. Virtually all of the major courses have some degree of small-group interaction.
- In most laboratory sessions in the basic sciences, except gross anatomy, students are divided into groups of 16–20 with one to two instructors per group. The faculty teach primarily through the lecture format, which often includes case presentations given by either basic science or clinical faculty to illustrate the clinical relevance of a basic science concept.
- Problem-based exercises are used in some courses for part of the small-group interactions.
- Standardized patients (representing a normal exam) are used in the Introduction to Clinical Medicine course and in the obstetrics–gynecology clerkship to teach students how to perform a pelvic examination.
- The medicine clerkship uses standardized patients in its departmental examination.

Application of Computer Technology

- Students are not required to own computers, although according to a recent survey, the great majority of students entering the college of medicine do own computers.
- Use of computer technology in the curriculum remains largely supplemental and elective.
- Required computer-based activities include a radiologic anatomy program used in the gross anatomy course, a nutrition-in-medicine program used in biochemistry, and case studies in the medical ethics course.
- The Department of Family and Community Medicine provides laptop computers to students on that rotation. These computers are used for communication with students at remote educational sites, transmission of graded presentations, and use of educational software programs.
- Other departments are gradually adding supplemental CDs and other programs to the library and will probably make these required parts of the curriculum in the future.

Changes in Assessment

- Standardized patients are not part of the assessment process, except in the Department of Medicine, which uses standardized patients in its departmental examination.
- Faculty observation of students contributes to overall assessment on clinical rotations, but faculty intermittently rather than routinely observe students examine one or more selected patients and grade them on that examination. As noted, formal methods for assessment of clinical skills are in development.
- There have been no major changes in assessment methods in the last few years other than the adoption of the NBME Subject Examinations in Pharmacology and Family Practice as final exams for the second-year course in pharmacology and for third-year students on the family practice rotation. (The other clinical rotations have used these exams as finals for years.)

Clinical Experiences

- Medical students have experience in three different university hospitals and a variety of outpatient settings.
- The major teaching hospital (USA Medical Center) is an acute medical/surgical hospital that has a regional burn center and a Level 1 trauma center in addition to the usual medical and surgical facilities. All obstetrics–gynecology patients and all pediatric patients (except for trauma) are cared for at the USA Children's and Women's hospital. In addition, USA Knollwood Park Hospital is a small acute care medical/surgical hospital that is also the location of a sleep center and a center for gastroenterology and neurology.
- Experience in inpatient psychiatric medicine is obtained at a local state facility.
- Experience with patients in a long-term care hospital is available on an elective basis.
- Some students on family practice rotations get experience with nursing home patients.
- All students on the internal medicine rotation get a brief exposure to hospice care.
- Students see outpatients in several different settings. All third-year students have exposure to outpatient clinics run by various departments.
- Students on the third-year family practice rotation spend the majority of their time with a physician in his or her office; many are located in rural sites.
- Office electives in a variety of specialties are available for senior students.
- A longitudinal clinical experience in a primary care clinic or physician's office is being developed for first- and second-year medical students.

Curriculum Review Process

- A process for formal review of the entire curriculum has not been established.
- Portions of the curriculum are reviewed each year by the curriculum committee. Particular areas to be reviewed are determined by any special initiatives that are under way that would affect specific courses or schedules, and by specific concerns raised by either faculty or students.
- For the year 2000, portions of the first- and second-year curricula are under review, as a part of determining how to institute a clinical experience for these students.
- Other areas under review are two-week and longitudinal fourth-year electives, clinical skills assessment, and clinical correlations in the basic science courses.
- The curriculum committee is charged with the responsibility for ongoing review of the curriculum. Issues to be addressed by the committee are determined as described above.
- The Student Promotion and Evaluation Committee reviews grading and promotion issues and disciplinary procedures.

Future Goals

Major issues likely to be addressed in the next five years include:

- Development of a longitudinal clinical experience that will involve students in at least the first two years of school and potentially students in all years.
- A procedure to document the competency of students in core clinical skills prior to graduation.
- Improvement of the ways in which the basic and clinical sciences are correlated.
- Determination of the best means by which to incorporate additional instruction in areas where the AAMC Graduation Questionnaire indicates possible deficiencies.
- Major revision of the medical ethics course.
- Incorporation of significantly more computer instruction into all aspects of the curriculum.
- Where feasible, increases in small-group interaction and in interactive experiences in lectures.
- Expansion of the standardized-patient program.

The University of Arizona College of Medicine

NANCY ALEXANDER KOFF, PHD

Curriculum Management and Governance Structure

- The formal governance structure gives the general faculty responsibility for the curriculum; course additions and deletions in the required curriculum and major curricular changes must be approved by the general faculty.
- Curriculum management is distributed among several entities:
    - The Curriculum Committee, which is advisory to the general faculty, is comprised of faculty and students; these groups are elected by their peers for six- and four-year terms, respectively. The Curriculum Committee serves three primary functions:
        - To advise and oversee the curriculum as a whole
        - To conduct in-depth reviews of the required curriculum
        - To oversee the interdisciplinary curriculum through standing subcommittees for three interdisciplinary courses and the elective curriculum
    - The associate dean for curricular affairs and the Office of Curricular Affairs
        - Serves as the point of coordination for documentation, approval, scheduling, and delivery of the educational program leading to the MD degree
        - Provides administrative coordination of the interdisciplinary curriculum
        - Provides general advice and support to course faculty
    - Academic departments provide focused management of departmentally based curricula.
- Three significant changes in the management of the curriculum were implemented in the 1990s.
    - With the expansion and consolidation of teaching programs in Phoenix, Arizona (located 120 miles from the primary College of Medicine site in Tucson), the office of the vice dean for Phoenix Programs provides management for clerkship and elective courses in that area.
    - The Curriculum Committee membership was expanded to include three faculty located in Phoenix.
    - Meetings of basic science course directors and the required clerkship directors are convened regularly by the associate dean for curricular affairs. Two clerkship directors' meetings each year are teleconferenced to Phoenix to include the clerkship faculty located in area training sites.

Office of Education

- The Division of Academic Resources (DAR) was established (under the former title of Office of Medical Education) in the early 1970s. Since its inception, this unit has provided
    - Instructional support for faculty
    - Faculty development programs for groups and individuals
    - Assessment of course and teaching effectiveness
    - Test scoring and analysis
    - Assistance with the development of instructional software and other teaching materials
    - Collaborative educational research
- In the late 1980s and 1990s the DAR's responsibilities were expanded to include
    - Learning skills and academic support services for both medical students and other Arizona Health Science Center (AHSC) students
    - Development of programs to effectively use the large, new, well-equipped Learning Resource Center
    - Implementation of the USMLE Testing Center
    - Initiation of the Deans' Teaching Scholars program and other faculty development programs serving all AHSC faculty
    - Development of course Web sites
    - Uniform course/clerkship and teaching evaluation program for the entire College of Medicine core curriculum
    - Administration of teaching spaces in the College of Medicine

Budget to Support Educational Programs

- There is a discrete budget to support the interdisciplinary curricular components, managed through the office of the associate dean for curricular affairs.
- The remaining and largest portion of funding for the educational program is allocated to departments based on historical funding levels.

- Primarily state dollars are designated to support the teaching program.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- A set of *Educational Objectives for the Program Leading to the MD Degree* was articulated and approved by the general faculty in 1997.
  - The Curriculum Committee consolidated two documents—the *Clinical Outcome Objectives* (developed through a consensus project of faculty) and the objectives contained in *Statement of Ideals for Medical Education* (developed as part of the college's curriculum renewal project)—to create an inclusive set of educational objectives for the MD degree program.
  - An assessment of the status of the college in meeting all of the educational objectives has been initiated by the Curriculum Committee, including an analysis of current methods of student performance assessment to assure that attainment of these objectives is being measured.

Changes in Pedagogy

- Although virtually every course and clerkship has implemented changes to enhance the students' learning experiences, those listed below have changed the character of the curriculum as a whole.
  - Currently, half of the total contact hours in years one and two are conducted in interactive formats such as laboratories, small-group discussions, conferences, field visits, and clinical skills sessions.
  - In the last decade the number of interactive contact hours has increased, largely because of the increase in small-group, case-based, problem-solving formats. These formats constitute significant components of several first- and second-year courses.
  - A separate PBL unit was implemented in 1998, consolidating learning in three year-one courses.
  - Significant progress has been made in efforts to integrate topics across the entire curriculum, beginning with the implementation of the integrated nutrition curriculum in 1993. Proposals currently are being developed for the integration of two other topics throughout the curriculum: cultural issues in health care and cancer prevention.
  - Several clerkships have added case-based, problem-solving sessions and PBL sessions.
  - A longitudinal preceptorship program for year-one and year-two students was implemented in 1998. Through the Longitudinal Clinical Curriculum (LCC), each student is paired with a preceptor and works with the preceptor two afternoons each month throughout semesters two and three, and weekly in semester four.
  - The Rural Health Professions Program (RHPP) was implemented in 1997. Fifteen students each year are admitted to the RHPP. These students are matched with physician–preceptors located in rural Arizona and work with their preceptors for a minimum of 11 weeks throughout their last three years of medical school.
  - An MD–MPH dual-degree program was implemented in 1998.
  - Increased flexibility has been introduced in the elective curriculum, with recent approval for students to engage in three longitudinal curricular activities that earn elective credit: serving underserved populations, conducting research projects, and participating in CPR teaching.
  - A general orientation to required clerkships is being designed for implementation in the 2000–01 academic year.
  - A series of interdisciplinary seminars is also planned for implementation in the 2000–01 academic year. These seminars will be designed to enhance the students' clinical education.

Application of Computer Technology

- Students are not required to own computers; however, the College of Medicine provides excellent access to computers in
  - the Learning Resource Center of the Division of Academic Resources
  - the Arizona Health Sciences Library computer lab (with 24-hour access)
  - the medical student lounge
- Computer technology is an integral part of the instructional program, with most courses employing several features including
  - on-line syllabi, schedules, and informational materials
  - self-assessment quizzes and instruction
  - videodisk materials
  - CD-ROM case studies
  - other forms of computer-aided instruction

Changes in Assessment

- An OSCE was implemented in 1988; passing the OSCE as a graduation requirement was adopted in 1990. Administered at the conclusion of required clerkships, the OSCE draws upon the long history of the use of standardized patients (SPs) at the College of Medicine. SPs have been employed for both teaching and assessment of students' clinical skills since 1976.
- One clerkship recently implemented a mini-OSCE to complement its end-of-clerkship performance assessment.

Clinical Experiences

- Students participate in the care provided in many different settings as part of their required clinical curriculum.
- Ambulatory teaching has increased over the past decade to constitute just less than half of all clerkship teaching.
- The settings employed in the required clinical clerkships and LCC preceptorship placements include
    - Inpatient units, including community hospitals, public general hospitals, major teaching institutions, and Veterans Affairs medical centers
    - Ambulatory clinics, both specialty and primary care, located in major teaching institutions
    - Community-based physicians' offices
    - Community health centers, in both urban underserved and rural areas
    - Research institutes
- In elective programs, including the rural preceptorship program, settings include all of the above in addition to
    - Private physicians' offices in rural communities
    - Hospices
    - Prison health systems
    - Indian Health Service settings
    - Long-term care facilities
    - Rehabilitation facilities
    - Free clinics, including those located in homeless shelters and domestic violence shelters
    - International settings

Curriculum Review Process

The College of Medicine's curriculum review and renewal project (the Comprehensive Curriculum Analysis and Planning Project) was initiated in the early 1990s, and the last set of recommendations from this effort for changes in the curriculum is being implemented this year.

- An abridged *Statement of Ideals for Medical Education*, the first document developed through the project, expresses the themes and goals of curriculum renewal at the College of Medicine. The ideal education of medical students
    - promotes the development of interpersonal skills, attitudes of compassion, and skills in patient advocacy, along with mastering medical knowledge, demonstrating responsibility in professional and societal relationships, and engaging in lifelong learning and self-directed inquiry.
    - provides medical knowledge that prepares them to engage in informed medical practice and research; supports our belief that attention to the prevention of illness and understanding of disease processes are equally important to the practice of medicine.
    - emphasizes the interrelationships of knowledge, skills, attitudes, and behaviors.
    - provides students with a learning environment that cultivates collegiality, and introduces them to conditions found or expected in the current and future practice of medicine.
    - increases students' learning efficiency to the highest levels, and prepares them to participate in, critically evaluate, and assimilate advances in medical knowledge and practice.
    - is organized to be flexible to respond to and advance changes in the field of medicine and medical education.
    - is accomplished by drawing on the widest collaboration among faculty, students, administration, and the community.
- The principal planning resources used included
    - Faculty leadership on the Steering Committee and major project committees
    - Faculty time, effort, and creativity—approximately 200 faculty served on project committees
    - DAR personnel expertise in curriculum evaluation, assessment, and pedagogy
    - Funding to support additional DAR personnel to staff the committees, develop materials, organize planning activities, solicit materials from other schools, and create newsletters and other information pieces
    - Funding support to bring educational consultants to the college
- The principal implementation resources used included
    - Faculty time and expertise to design, implement, and participate in new curricular components
    - Office of Curricular Affairs administrative support for implementation of the PBL unit, and additional fund-

  - ing support for the design of the LCC, the orientation to clerkships, and interdisciplinary seminars
  - DAR personnel expertise in assessment and faculty development to support the PBL unit
  - Funding to support part-time faculty director of LCC
  - Community-based and university faculty to precept students in the LCC
- ◆ The principal challenge was finding faculty time to participate in the many activities necessary to undertake the project and to implement recommendations approved by the general faculty. This challenge was especially acute in light of the strong managed care environment in Arizona.
- ◆ A specific evaluation strategy has been designed for each new curriculum component.
- ◆ In 1990, the College of Medicine implemented a revised procedure for the comprehensive review of the required curriculum.
  - Each course/clerkship is reviewed on a five-year cycle by a subcommittee of the Curriculum Committee.
  - These subcommittees, composed of a broadly representative number of faculty and students, conduct an in-depth review of
  - Learning goals and objectives of the course/clerkship
  - Course/clerkship structure and instructional methods
  - Core content and clinical learning experiences
  - Teaching effectiveness and teaching quality
  - Methods of student-performance assessment
  - Availability of resources and future plans for the course/clerkship
- ◆ The Curriculum Committee recently implemented procedures for the review of interdisciplinary topics throughout the curriculum, and currently is considering enhanced procedures to assure the quality of the elective curriculum.

Future Goals

- ◆ Issues likely to be addressed by the Curriculum Committee in the next five years include
  - Supporting increased integration in the curriculum, including the continuing integration of basic and clinical sciences
  - Meeting the goals of providing a solid, broadly-based educational program while providing increased opportunities for students to engage in independent learning
  - Continued development of strategies to support the assessment of student performance of clinical skills
  - Continued development of learning activities to enhance students' problem-solving skills and to support their continued learning throughout their professional lives
  - Further development of strategies to assess the interdisciplinary topics woven throughout the curriculum

University of Arkansas for Medical Sciences College of Medicine

JAY H. MENNA, PHD, AND RICHARD P. WHEELER, MD

Curriculum Management and Governance Structure

- Management of the curriculum is the responsibility of the faculty of the college.
- Major teaching departments in the college elect representatives to the Curriculum Committee.
- For clinical departments without responsibility for a clerkship, a single member is elected to represent several departments.
- The Curriculum Committee is responsible for monitoring the curriculum of the college, for making recommendations for change based on results of standard course and clerkship student evaluations and on the results of external evaluations.
- The Curriculum Committee is responsible for staying abreast of contemporary changes in health care delivery and their impact on defining the appropriate educational experiences for students; in so doing the committee considers contemporary changes in the curricula of other medical schools.
- The committee has endorsed operating guidelines for the management of the curriculum which have resulted in a much more expedient process for effecting curricular change and, as a result, has invigorated the curriculum of the college.

Office of Education

- The College of Medicine is one of four colleges on campus supported by the Office of Educational Development (OED).
- The OED was established in 1975 and is staffed by education professionals who are assigned to one or more of the colleges on campus.
- During the 1990s the OED has become extremely proactive in assisting the Curriculum Committee, faculty, and administration of the college in improving the curriculum.
- The director of the OED now serves on the Curriculum Committee as an *ex officio* member.

Budget to Support Educational Programs

- The Office of Student and Academic Affairs has a separate budget. Funds from that budget support some of the educational activities of the college.
- The dean's office funds required educational activities that are outside the domain of a department or division.
- All departments and divisions in the college with responsibility for a course and/or clerkship receive supporting funds from the dean's office.

Valuing Teaching

- Faculty whose primary responsibility is medical student education receive recognition for their efforts.
- The Master Teacher Award is conferred annually on the most outstanding teacher in the college, based on nominations from peers and committee selection. The winner receives a $2,500 check and a plaque.
- The college confers an award of $1,000 and a plaque on the faculty member who has made the most significant contribution to the area of educational innovation.
- An award of $1,000 and a plaque are also given to the faculty member who has made the most significant contribution in the area of educational research.
- Merit salary increases are given to faculty members with heavy educational responsibilities who are recognized as having contributed significantly to the educational mission of the college.
- The Promotion and Tenure Committee recognizes the educational contributions of faculty.
- The college has established a standard protocol for documentation of faculty educational contributions.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Faculty are in the process of identifying learning outcomes. These outcomes must consider the requirements of the Americans with Disabilities Act.
- Currently students are required to pass both USMLE Step 1 and USMLE Step 2 to graduate.

Changes in Pedagogy

- There has been an increase in the number of small-group learning sessions due to Introduction to Clinical Medicine (ICM) courses established in 1997.
- There are more small-group sessions in the first-year physiology and biochemistry courses.
- There are small-group sessions in the second-year pathophysiology courses.
- In the ICM course, cases are used extensively, including to teach principles of history taking as well as professionalism and ethics.
- A quarterly ethics forum, open to all four classes, features presentations by third- and fourth-year students on ethical and professional issues of cases, with comments by the dean, faculty, and the chairperson of the Division of Medical Humanities.
- Standardized patients are used in the first-year ICM course and in some clerkships for teaching.

Application of Computer Technology

- Computer technology is integrated throughout the curriculum.
- Year-one students in the first- and second-year longitudinal ICM course use computers weekly to correspond with their preceptors in response to required questions generated during small-group sessions. Students also are required to offer comments of a personal nature in response to the questions.
- Many course examinations in years one and two are computerized. This affords more efficient data collection and better preparation of students to take the computerized USMLE Step 1 and Step 2 examinations.
- Students use computers in many basic science courses and in some clerkships to access required or recommended Web-based learning modules. There are also computers at the UAMS Library Learning Resource Center that can be used by our students.
- The Curriculum Committee is working with clerkship directors who would like to institute more computerized learning modules in their clerkships.
- In 1992–93, the College of Medicine established a committee that works closely with course and clerkship directors, as well as other faculty, to produce computer learning modules. This committee addresses the technical aspects of the process and acts in an advisory capacity regarding other issues attendant on the implemention of computer learning modules.
- The University Hospital recently adopted an E-chart program that students and residents are required to be trained on and to use.

Changes in Assessment

- At the end of the second year, students must pass an OSCE, which uses standardized patients, that assesses their ability to perform a comprehensive physical examination, including taking a medical history.
- In their fourth year, students must pass a clinical practice examination (CPX), which also uses standardized patients, in order to graduate.
- The College of Medicine has a clinical skills center devoted exclusively to assessing student clinical skills.
- All assessments using standardized patients are formative as well as summative.
- Computers are used for students to complete the written component of their clinical skills examinations.
- Many of the basic science courses use computerized examinations.
- Faculty observe students during their preceptor sessions and in the OSCE and CPX examinations.

Clinical Experiences

- In the second-year ICM course students are required to spend time in physicians' offices in the community.
- Students have the opportunity to participate in the "Day with a Doctor" program during their first year.
- Most students participate in the Area Health Education Center (AHEC) Preceptorship Program, between their first and second and second and third years.
- During their third and fourth years, students spend time in numerous clinics and the hospital wards at the University Hospital, Arkansas Children's Hospital, the Little Rock VA Hospital, and the North Little Rock VA Hospital.
- During the four-week geriatrics rotation in the third year, students spend time at nursing homes, transitional care units, the geriatric clinic, and at a hospice.

Curriculum Review Process

- An internal standard student-evaluation protocol for courses/clerkships has been in place for over ten years. The system is now Web-based as a means of receiving evaluation data more efficiently.
- The college continues to use an external course/clerkship evaluation system employing content educational experts. The data accrued from both the student internal standard evaluation process and the external evaluation process have been invaluable in effecting recent curricular changes.
- The central theme of the curricular reformation process

is, and has been, a cohesive presentation of basic science course principles and concepts in a clinical context and better integration of our clinical curriculum.

- The college has significantly integrated basic science courses and implemented the two-year longitudinal Introduction to Clinical Medicine course, which addresses the important topics of professionalism and humanism in the practice of medicine as well as the clinical importance of the sciences basic to medicine.
- The overarching theme of the curriculum is the optimal preparation of our students to competently enter graduate programs armed with the scientific basics and an understanding of the importance of humanism and professionalism in medicine.
- The Curriculum Committee carried out a comprehensive survey of the topics addressed in the basic science courses using the topic analysis of the USMLE Step 1 examination as a template. All basic science course directors were asked to complete this exhaustive survey. The results were then analyzed to address unacceptable redundancy and areas of deficiency. The results served as the foundation for a comprehensive course-topic integration process.
- The ICM courses were instituted to give our students an earlier and well-structured exposure to the medical history and the physical examination and to serve as a forum in which to address important basic science principles and concepts in a clinical context.
- The ICM courses were added to the curriculum to address in a formal manner the issues of professionalism and ethics in medicine. In the near future, the Curriculum Committee will address the important topic of communication.
- The issue of cultural diversity is addressed in the curriculum of the college and will be expanded in the future.
- Currently, the Curriculum Committee is addressing the third- and fourth-year curricula to ascertain whether they are educationally sound. An ad hoc committee consisting of some of the best clinical instructors in the college has been appointed and charged by the Curriculum Committee to critique the curricula of these years. None of the members of this ad hoc committee is a clerkship director or departmental chairperson.
- In March 2000, fourth-year students will be required to pass a four-week block of instruction called the 10th Block Course. The tenth, four-week, block is the last four-week block of the fourth year. The curriculum of the 10th Block Course is as follows: Week 1—"Surviving Your Internship Year"; Week 2—"Death and Dying"; Week 3—"Nutrition and Prevention"; and Week 4—"The Law and Medicine, Informatics, and The Medical Marketplace." The tenth-block course was instituted as a way to make more concrete topics that were taught previously in the curriculum and to discuss important issues that relate to graduate medical education.
- One of the challenges in the process is the inherent difficulty of change itself. The faculty at the medical school is facing the same pressures as at other medical schools, and one of the most significant is the issue of time. The climate of medical education is not optimal for effecting changes in the educational process.
- The Curriculum Committee, working closely with the Office of Educational Development, will develop additional effective evaluation instruments to evaluate curricular changes. These instruments will be developed while the goals and objectives of the proposed changes are being defined.
- All newly instituted courses will be evaluated by an external content expert every five to seven years. New courses, such as the 10th Block course, will be externally evaluated soon after initial implementation.
- The teaching activities of faculty will be addressed using student-based standardized evaluation instruments and a Web-based process, as is currently being done in the college. These standardized instruments have been approved by the faculty and the Promotion and Tenure Committee of the college.

Future Goals

- The college continues to address the quality of the ICM courses, both the first-year and second-year components. Better integration is needed in the curricula of these two courses.
- The integration of basic science courses must continue. The quality of the educational experience of the students in the basic sciences courses has improved as a result of rather extensive integration, but this process must continue as the relative importance of topics changes and new topics are added.
- The use of standardized patients for assessing the clinical skills of the students will continue and will be expanded as more clerkships use them to assess students. Basic science courses more than likely will use them in the future. The OSCE and the CPX will continue and will evolve in the process.
- The college will address the quality of the third-year clerkships and the fourth-year curriculum.

University of California, Davis School of Medicine

VIJAYA KUMARI, MBBS, PHD

Curriculum Management and Governance Structure

- The University of California has a strong commitment to shared governance.
- Definition and oversight of the curriculum resides with the academic senate composed of all full-time faculty of the school.
- The elected Faculty Senate Executive Committee appoints the Committee on Educational Policy (CEP), which has the responsibility to advise on all elements of curriculum oversight.
- Oversight of each course/clerkship is assigned by the CEP and the academic senate to a department or clinical division.
- Each departmental/division chair appoints an instructor of record for the management of each assigned course and clerkship.
- The instructors of record are the key educational leaders for the implementation of courses and clerkships.

CURRICULUM RENEWAL PROCESS

Objective

- Since its inception in 1968, the goal of the school has been the training of the generalist physician. This mission will continue to shape the curriculum.

The Challenge

- Medicine is facing unprecedented challenges brought about by the massive expansion of biomedical and technologic knowledge, the increasing demands placed on health care delivery by the psychosocial circumstances of the patient and the scope of unpredictable changes occurring in the organization and financing of medical care. The first-year class of 1999 will be an average age of 48.5 years old in 2020. They will be at the height of their medical careers. As future practicing physicians during the early decades of the 21st century, these and later students must be in the position to fully assimilate these inevitable transformations into optimum medical care.

Guiding Principles

- The mission of the school is to provide students with a solid foundation for continuous scholarship and dedicated service to patients and society.
- The school must examine the knowledge, competencies, skills, and attitudes that the students should acquire during their medical training in light of the changes that are transforming the practice of medicine.
- The school must assess its objectives and teaching methods to ensure that the curriculum is providing the skills needed for lifelong learning.

Timeline for Curriculum Renewal

1994–95: School-wide strategic planning process. The objectives of the strategic planning process were to address the missions, goals, and objectives of the institution and recommend strategies for education, research, patient care, and public service. The strategic plan included four major recommendations for education:

- The school should undertake review and renewal of the medical student curriculum to ensure its relevance for educating the physician of the future.
- Major investments should be undertaken in information technology.
- A more effective reward system for teaching should be established.
- A broadened educational mission should be endorsed that formally recognizes the entire spectrum of educational programs.

October 1996: curriculum retreat—"The Physician of 2020." Specific review and renewal of the curriculum for the MD degree program started with this school-wide, two-day retreat. The retreat was attended by 80 faculty, with extensive representation of department chairs, instructors of record of required courses and clerkships, members of the Committee on Educational Policy, and students and administrators. This retreat helped to establish a broad consensus for curriculum renewal.

January–September 1997: CEP task forces—framework for renewal. Five task forces were appointed to develop the guid-

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ing principles that would underlie the curriculum-renewal process. The members were faculty, students, and administrators. Leadership for the task forces was provided by members of the CEP. The task forces made a series of recommendations that addressed (1) competencies, attitudes, skills, and knowledge of graduates; (2) teaching methods; (3) course objectives and assessment methods; (4) topics requiring greater emphasis; and (5) mechanisms of curricular oversight. The summary report set the stage for detailed review of the curriculum and development of specific proposals for reform.

September 1997–May 1998: curriculum assessment and formulation of proposal. Based upon the work of the task forces, the CEP embarked upon a detailed study of the curriculum. A questionnaire was administered to the instructors of record of all courses and clerkships to gather specific information about educational philosophies, teaching and evaluation methods, expectations of student workload, coverage of underemphasized topics, teaching effort, and resources needed to accomplish teaching objectives. Task forces composed of faculty members and students were formed to recommend optimal methods of student assessment, course and faculty evaluation methods, and course/clerkship organization. A separate task force administered and analyzed the questionnaires. A student task force composed primarily of third-year students discussed and reported on a variety of approaches for curriculum renewal and ways to improve advising systems.

Following extensive deliberation by the CEP, the following series of specific recommendations for curriculum reform were formulated, with the intent that these would be presented to the faculty at a second retreat.

- Develop an interdisciplinary, longitudinal, case-based, small-group discussion course spanning all four years of the curriculum.
- Develop service-oriented, clinical selectives designed for first- and second-year students.
- Reexamine current requirements for clerkship experiences in orthopedics, urology, physical and rehabilitation medicine, ophthalmology, otolaryngology, neurology, and emergency medicine.
- Integrate individual courses in patient evaluation, physical diagnosis, and psychiatry.
- Identify mechanisms to incorporate each of the "underserved subject areas" identified by faculty into the curriculum.
- Identify and eliminate obstacles to curriculum development and teaching excellence.

April 1998: by-law changes regarding curriculum governance. Extensive changes were made to the by-laws, which provided clearer definition of the responsibilities of curriculum oversight, charging the CEP with the responsibility to define the goals, objectives, and structure of the curriculum, including the competencies, attitudes, skills, and knowledge expected of all students.

June 1998: the second curriculum retreat. The objective of the second curriculum retreat was to provide an opportunity for participating faculty and students to discuss in greater depths the principles guiding curriculum review and reform and to consider the specific recommendations stated above. There was consensus on the principles guiding the curriculum reform, and the participants strongly supported further development of the individual elements. The participants also recommended that the school expand the advisor system to encourage student self-assessment and career counseling and develop more reliable assessment instruments for evaluation of student performance, teaching, and course efficacy in order to monitor the impact of curriculum changes.

September 1998–January 1999: program development. The CEP formed a new series of task forces to further develop specific curriculum reforms through consultation with key faculty and instructors of record. The task forces met with small groups of faculty to discuss the proposed longitudinal course, underserved topics, third- and fourth-year clerkships, and first- and second-year patient evaluation and physical diagnosis courses. These deliberations laid the groundwork for identification of pilot programs.

January 1999: prospectus for curriculum reform. In January 1999, the CEP and its task forces presented to the faculty and administration a complete prospectus, the Prospectus for Curriculum Reform, which summarized the previous work, outlined the broad goals of the reform, and presented objectives and descriptions of specific pilot programs. The prospectus also identified resources needed to support renewal as well as potential problems in implementing the changes.

The main objectives of the prospectus are presented below.

Prospectus for Curriculum Reform

- Correct weaknesses in the curriculum.
    - Clearly articulate, develop, reinforce, and evaluate those professional Competencies, Attitudes, Skills, and conceptual Knowledge (CASK) that are essential for the development of competent and compassionate physicians.
    - Resolutely promote student responsibility for self-directed learning in order to better prepare graduates for lifelong professional development and critical thinking.
    - Stimulate broader faculty interest, collaboration, and

  communication in the overall educational program to ensure effective integration, flexibility, and depth of the curriculum.
  - Develop an internal mechanism to facilitate the effective incorporation of currently underemphasized topics and experiences relevant to students' preparation for the practice of medicine.
- Strengthen institutional support and recognition for teaching.
  - Clarify the teaching expectations associated with each type of academic appointment.
  - Work with department chairs to clearly delineate and communicate the teaching expectation associated with each faculty appointment and provide faculty with the critical supports and resources needed to fulfill their teaching responsibilities.
  - Develop an effective and equitable tracking system to ensure that teaching expectations are met in terms of both quantity and quality.
  - Create an effective mechanism to accurately evaluate and document teaching performance for the merit and promotion review process.
  - Recognize, encourage, and reward outstanding teaching efforts by individual faculty members and departments.
- Promote educational excellence.
  - Stimulate interdisciplinary faculty interest and participation in curriculum planning and development.
  - Encourage faculty development and leadership in the areas of teaching and evaluation methods.
  - Provide a network of educational supports and resources for curriculum assessment and development.
  - Promote and support faculty research in medical education.
  - Focus activities described above within the Center of Excellence for Education, which will serve as an intellectual forum for educational planning and evaluation.
- January 2000: curriculum reform pilots: Two of the pilot programs described in the Prospectus were implemented in January 2000. The case-based longitudinal course, "Application of Medical Principles," was instituted as a requirement for a single quarter in the second year, and a cohort of third-year students took this course as an elective in conjunction with their required rotation in women's health. The clinical selectives course, "Doctoring," was taken as an elective by 30 first-year students. These pilot programs are currently being evaluated in conjunction with further development of the other initiatives outlined in the Prospectus. Updates on curricular reform initiatives at UC Davis are available at ⟨http://flexner.ucdavis.edu/⟩.

University of California, Irvine, College of Medicine

ALBERTO MANETTA, MD

Curriculum Management and Governance Structure

- Changes have occurred with the appointments of a senior associate dean for educational affairs and an associate dean for curricular affairs.
- The Office of Curricular Affairs (OCA) is charged with monitoring the curriculum and with presenting to the faculty curriculum committee (CEP) suggestions for improvement.

Office of Education

- The Office of Curricular Affairs was established in 1993.
- The existence of the office led to significant curricular changes, including the complete restructuring of the third year, which is presently taking place.
- The office developed new courses and suggested to the faculty curriculum committee (CEP) the discontinuation of others.

Budget to Support Educational Programs

- There is a budget to support the educational programs, established about seven years ago.
- The sources of funding are the college of medicine and directly through the university as result of a special fee charged to all students attending medical school.

Valuing Teaching

- There is a formal faculty development program for residents but there is not one for faculty.
- Several faculty development seminars have been held.
- In addition, every year before the academic year begins, several courses hold special sessions for faculty.
- A special track for the clinician educator (Clinical X) has existed for a long time but has only recently been implemented.
- Funding is now provided by the dean's office for support of this faculty effort.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school does not have "global" learning objectives, but every course has its own learning objectives.
- The students must pass a comprehensive exam before graduation. This exam uses standardized patients, and it is based on our experience with the Southern California Macy's project.

Changes in Pedagogy

- The major changes have been the decrease of didactic teaching and the increase of small-group sessions. Several courses are now taught in small-group sessions exclusively.
- Also, there is more exposure to evidence-based medicine.
- There is more emphasis on applied knowledge, i.e., how students use their knowledge to address a particular clinical situation. Several clerkships are standardized-patient exams to emphasize the importance of the application of knowledge.

Application of Computer Technology

- Students are not required to own computers, but recent surveys show that more than 80% of them own and have significant experience with computers.

Curriculum Review Process

- Every course in the college of medicine undergoes a summary review every year. If the summary review reveals problems, the course is evaluated in depth.

- An ad hoc committee is appointed to review the course. The committee is properly staffed by Educational Affairs. The committee chair is encouraged to visit other schools or to bring in outside scholars who can help in the process.
- Several courses go through an in-depth review every year.
- The decisions after review have ranged from minor correction (the psychiatry clerkship) to discontinuation of a course (musculoskeletal).
- The curriculum renewal process started in 1993 and is ongoing.
- The barriers have been the typical barriers encountered in other schools: "it is not broken"; "our students passed the USMLE."
- New barriers have been the increased emphasis on clinical and research productivity required from our faculty.
- Centralization of several educational units has led to budgetary savings, and funds through grants and contracts have been made available.
- Perhaps the most important factor is the serious commitment from the dean's office.

University of California at Los Angeles School of Medicine

LUANN WILKERSON, EDD, CAROL S. HODGSON, PHD, AND JOHN TORMEY, MD

Curriculum Management and Governance Structure

- In 1992, the elected faculty governing body of the UCLA School of Medicine reformulated the curriculum committee to create a core of faculty members committed to an institutional rather than a departmental perspective on medical student education. Student representatives and administrators round out the team.
- One of the first actions of the new Medical Education Committee (MEC) was to develop an educational mission statement to guide the review and oversee the ongoing improvement of the curriculum. For more information, see ⟨http://www.medsch.ucla.edu/som/mission.htm⟩.

Office of Education

- In 1992 the dean established the Center for Educational Development and Research (ED&R) to provide instructional coordination, curriculum design, and faculty development resources for the faculty.

Budget to Support Educational Programs

- Several years ago, the University of California implemented increased fees for professional school students across the system.
- This new funding source was designated for education and has supported much of the innovative programming at the UCLA School of Medicine in the past four years. In particular, it was used to fund the development of instructional technology initiatives.
- The funding is now being used to support a portion of the costs associated with curricular planning and implementation for the three new phases of the curriculum.

Valuing Teaching

- In 1994, the Center for ED&R was charged by the MEC to develop and implement a school-wide course and faculty evaluation system.
- The Faculty Fellowship in Medical Education is sponsored by the Center to assist educational leaders in developing competencies in curricular planning and program evaluation.

CURRICULUM RENEWAL PROCESS

Over the past eight years, the MEC has organized a wide variety of task forces and subcommittees in an evolving process of curricular change supported by the educational faculty and staff in the Center for ED&R.

Learning Outcomes

- A set of graduation competencies was designed and linked to the Educational Mission Statement with associated objectives for each year of the curriculum. See ⟨http://www.medsch.ucla.edu/som/gradcomp.htm⟩.

Changes in Pedagogy

- The Doctoring Curriculum was implemented. This is a required three-year, longitudinally organized set of courses focused on students' development of clinical skills within a biopsychosocial perspective including problem-based learning, standardized patient exercises, case discussions, and community preceptorships.
- Recently a set of videotape vignettes on the culture of medicine has been developed to prompt the discussion of issues of professionalism.
- First-year course directors cooperated in reducing course hours to implement a year-long interdisciplinary, problem-based learning course, Clinical Applications of Basic Science, to assist students in integrating and applying material from the lectures and laboratories in concurrent courses.
- Students are required to research learning issues and post summaries of their reports on a tutorial Web site.
- The second-year pathophysiology of disease course was

restructured to include a series of multi-system case studies conducted in a problem-based learning mode to stimulate skills in clinical reasoning and the assessment of complex disease processes.

- Grants from the Culpeper Foundation, the Arthur Vining Davis Foundation, the Whittier Foundation, OHSS, the National Cancer Institute, California Department of Developmental Services, and the AAMC have led to new curricular content in primary care, humanism, cultural competency, spirituality, nutrition, cancer prevention, developmental disabilities, and geriatrics.
- A four-week clerkship in family medicine was instituted as a core requirement for all students, with lecture sessions on nutrition and other preventive medicine topics to increase students' experience in primary care.
- In the surgery and obstetrics–gynecology clerkships lectures were replaced with case-based, small-group discussions to promote self-directed learning and the development of clinical reasoning skills.

Application of Computer Technology

- A Web presence for the curriculum was developed with multimedia, interactive learning and evaluation tools associated with the core courses and clerkships and a computer requirement to guarantee students' access to these materials for the purpose of building skills for lifelong learning. These initiatives have been made possible by the addition to the Center for ED&R of the Instructional Design and Technology Unit with educational and technical expertise and funding of faculty minigrants.
- The first-year human nutrition and biochemistry laboratory was revised to engage students in the research and on-line publication of nutritional papers in order to learn skills in data collection, data analysis, library research, and writing. See ⟨http://www.medsch.ucla.edu/som/ddo/biolchem/nut-1998/index.html⟩.

Changes in Assessment

- A clinical performance examination for fourth-year students was developed as part of the Southern California Consortium funded by the Macy Foundation to increase feedback to students on their clinical skills and generate data for curricular evaluation.
- An OSCE testing the physical examination skills of third-year students was implemented in 1999 to provide feedback to students prior to beginning their clinical rotations and to evaluate the new clinical curriculum.

Curriculum Review Process

- The Center for ED&R and the Office of Student Affairs provide regular reports to the MEC on curricular outcomes.
- Presentations include the results of USMLE scores, residency matches, the AAMC Graduation Questionnaire, the clinical performance examination, the curriculum survey, the Well-Being Survey, UCLA alumni surveys, course/clerkship ratings by students, and course-specific program evaluation studies.
- An annual clerkship directors' conference provides another opportunity for faculty members to discuss curricular outcomes and plan curricular revisions.
- In 1996, the MEC established the Curriculum Structure Task Force to consider whether and how the curriculum could be improved by a major restructuring.
    - The report of this committee led to the adoption of a set of guiding principles and organizational constructs for the planning of a new four-year curriculum that includes three phases (described below). Over 200 faculty members have been involved in this effort to date.
    - Planning and implementation began with the principal focus on the clinical curriculum.

Future Goals and Challenges

- The new *core clerkship phase* for the third year will be implemented in the summer of 2000. This phase will begin with a two-week transition course, Clinical Principals. All of the required rotations will be completed within the ensuing 52 weeks. Other features of the core clerkship phase include:
    - The organization of clerkship teaching around "what is important for all physicians to know"
    - Increased outpatient experiences in surgery, psychiatry, and neurology
    - More multidisciplinary teaching, e.g., shared sessions in psychiatry/neurology, internal medicine/family medicine, and pediatrics/obstetrics–gynecology
    - Centralized core lecture sessions and workshops on radiology and clinical skills to initiate each curricular block
    - More clearly stated expectations for students
    - More emphasis on the teaching and testing of physical examination skills
- The *college phase* for the fourth year will be implemented in 2001 to provide more structure and guidance for the students' experiences during the fourth year. The mech-

anism created to accomplish these goals is the academic "college."

- The college is a community of faculty and student scholars for the purpose of study and instruction incorporated within the school. The colleges will be the intellectual home for students in the fourth year.
- Students will join one of four colleges based on career interests: primary care, acute care, applied anatomy, and medical science. The college will oversee 50% of the students' curricular time in the fourth year.

- ◆ College activities will include:
  - advising/mentoring activities
  - a block of instruction including current scientific findings with bench-to-bedside implications
  - a required scholarly project
  - required clinical rotations and recommended electives
  - a longitudinal experience in patient care or research
  - evening seminars of faculty and students
- ◆ Planning has just begun for the new *human biology and disease phase*. This phase will occupy the first two years. It is intended to create a more integrated curriculum of basic and clinical sciences arranged in a sequence of blocks. Curriculum content, sequencing, and implementation are being planned by multidisciplinary teams of faculty and students. Implementation in 2002 is projected.
- ◆ This phase will include:
  - Four multidisciplinary blocks with each block teaching once in the first year and once in the second
  - A theme-based organizational structure rather than a series of discipline- or organ-based mini-courses
  - Integration of basic sciences, pathophysiology, social sciences, and clinical skills into single blocks with horizontal and vertical thematic threads
  - The introduction of general pathology concepts early in the first year and woven throughout so that structure and function, normal and abnormal can be taught side by side in order to illuminate one another

University of California, San Diego School of Medicine

MARIA SAVOIA, MD

Curriculum Management and Governance Structure

- The faculty is responsible for the content and quality of the educational program.
- Each core course is governed by an interdisciplinary course committee headed by a course chair.
- The core course committees report to the Core Curriculum Committee (CCC), which is responsible for oversight of the required curriculum throughout the four years of medical school.
- The CCC also is responsible for appointing core course chairs.
- The school has an extensive elective curriculum with offerings in years one, two, and four in addition to a requirement for the completion of an Independent Study Project (ISP).
- The elective curriculum and ISP are the province of the Electives Committee (EC).
- Both the CCC and the EC report to the Committee on Educational Policy (CEP), which is charged with curriculum oversight on a broader level.
- The CEP reports to the Faculty Council, the governing body of the School of Medicine.
- The appointment of an Associate Dean with a strong interest in education who has hired others with educational training and skills to complement those of the faculty has inspired the faculty and administration to work more cohesively to provide curriculum oversight and innovation.
- The associate dean provides continuity and institutional memory, and the members of her staff provide committee support.
- The associate dean has convened quarterly meetings of both the preclinical and the clinical course chairs to discuss common problems and find solutions. A number of initiatives arising from these groups have been implemented by the faculty committees governing education.
- The CEP has broadened its charge to include issues related to undergraduate admissions, academic promotion, and student life, in addition to overseeing the educational program.
- Representatives from the committees dealing with these areas now sit on the CEP. This has allowed faculty a more comprehensive view of how the curriculum affects student recruitment, retention, and morale.
- The CEP also is charged with oversight of graduate medical education and allied health professional education.
- In the past several years, governance of graduate medical education has become more centralized and the CEP has become much more involved in the oversight of graduate programs.
- The CEP has provided a forum for discussing the interrelationships of undergraduate and graduate education.

Office of Education

- Educational support is centralized in the Office of Learning Resources (OLR), which reports to the associate dean of curriculum and student affairs. Since 1990, the OLR has grown significantly.
- Two new assistant deans for curriculum have been appointed to the office.
- A standardized-patient program has been developed within the OLR.
- Those individuals who provide administrative support for the core clinical clerkships and all major interdisciplinary clerkships now are funded through and housed in the OLR.
- Computer support for education has expanded greatly in the past ten years, and individuals with both the technical and educational expertise to help faculty with computer-based education are very important members of the OLR.
- An instructional design unit within the Learning Resources Center of the OLR has been developed and the work products of this unit have greatly enhanced the educational program.

Budget to Support Educational Programs

- The budgets to support the core and electives curricula are centralized under the associate dean for curriculum.

- Budgets are negotiated yearly with the vice chancellor.
- Funding comes primarily from the state of California.

Valuing Teaching

- Teaching activity is required for promotion in many faculty series.
- Over the past several years, emphasis on the demonstration of excellence in teaching for faculty promotion has increased dramatically.
- A new series, Professor of Clinical X, has been developed and implemented to recognize outstanding clinical educators. This series carries the same privileges as the tenured faculty series.
- At UCSD faculty salaries are negotiated by the department chairs with the vice chancellor on a yearly basis.
- The associate dean for curriculum advises the vice chancellor regarding those faculty who make major administrative contributions to the educational program. These individuals have a portion of their salaries allocated from vice chancellor's office funds. For example, all the third-year core course chairs either have an FTE (i.e., derive their salary from state funds already) or receive the equivalent of half of an FTE for their contributions to the educational program.
- The faculty physician medical group (which is responsible for allocation of clinical income) recently instituted the Primary Care Practice Plan, which allocates funds from the departments for time spent teaching medicine to undergraduates and house officers.
- The school participated in the mission-based management program sponsored by the AAMC. Prior to the initiation of the program, the school had developed an algorithm for capturing educational activity and had made some progress in deciding how this activity would be rewarded.
- The mission-based management concepts met with great resistance from some members of the faculty, which slowed the progress that had already been made by those faculty working on an educational model.
- The school is now renewing efforts to find ways to more tangibly recognize individual teachers' contributions to the educational program.
- UCSD has a number of both institutional and departmentally based faculty awards for teaching.
- Faculty, housestaff, and students all have awards that they give on a yearly basis.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Each core course has defined learning objectives, and these are reviewed by the CCC when the course undergoes its required review at least every three years.
- Recently, the third-year core clinical course chairs, together with the associate and assistant deans for curriculum, defined a set of core skills and competencies required at the third-year level.
- The competencies were divided among the clerkships, and the core clerkships have been charged with assuring the competencies have been met.
- The required fourth-year clinical practice exam (CPX), part of the Southern California Consortium for the Assessment of Medical Students, assesses the students' attainment of these competencies as a class and as compared with other Southern California medical schools.
- Students' overall performances and individual weaknesses are reported to the core clinical course chairs for student remediation and curriculum changes within the clerkships.

Changes in Pedagogy

- Over the past ten years, there has been an increase use of small-group discussion, an increase in those discussions that use cases to introduce concepts to students, and a decrease in the amount of lecture time.
- The faculty has introduced more group assignments and group-learning activities outside the traditional classroom setting as well. For example, instead of lectures on immunity or the immunocompromised host, the microbiology faculty provides students cases of patients with different infections and charges the students (who prepare in small groups) to discuss the pathogenesis of each infection, as well as the host defects that predispose the patient to the particular microbe. The students then present and explain their findings to each other.
- Standardized patients (SPs) are used for both teaching and assessment throughout the curriculum.
- Students are introduced to both real and standardized patients throughout the preclinical years.

- Students have a required OSCE, which they must pass, as a part of the Introduction to Clinical Medicine course in the second year.
- The third-year longitudinal primary care clerkship uses SPs to teach about cultural competency and the third-year required medicine clerkship uses SPs to teach about pain management and end-of-life care.
- The primary clerkship has a four-station SP "assessment" as a midterm exam midway through the third year.
- In order to graduate, all students are required to pass an eight-station clinical practice exam using SPs at the beginning of their fourth year.

Application of Computer Technology

- Students are not required to have personal computers but more than 80% do, and networked computer workstations are available at strategic locations throughout the school and clinical sites for students' use.
- Computer-based educational offerings supplement the standard curriculum in almost every course.
- Use of the Internet for delivery of instructional materials, self-assessment tools, electronic resources and references, schedules, and administrative information is widespread.
- Electronic mail, Web-based forums, and bulletin board systems are used for communication and collaboration throughout the curriculum.
- The assistant dean for curriculum and educational computing meets with faculty routinely to provide new computer-based materials for incorporation into courses.
- In addition, she and her staff, in conjunction with the faculty, have designed a number of unique computer programs to fill specific curricular needs.
- Digital libraries of histology, pathology, and hematology images; clinical case simulations and problem-solving exercises; and clinical anatomy lessons in virtual reality are examples of UCSD-developed curricular innovations based in information technology.
- The Office of Student Affairs and the Office of Learning Resources both have created an extensive Web presence to direct students to educational opportunities and academic resources.
- Overall, utilization and integration of computing and communication technologies in the curriculum is reviewed by the Medical Informatics Subcommittee, established in 1998 by the CEP.

Changes in Assessment

- The school has decreased its reliance on multiple-choice examinations in the preclinical curriculum, and workshops have been held to help faculty write better exam questions.
- Faculty must observe every student performing both a number of complete histories and physicals and other selected aspects of the clinical exam during the Introduction to Clinical Medicine course.
- Each student must turn in a "Blue Book" with faculty signatures indicating the completion of a number of required tasks in order to pass the course.
- A similar process to demonstrate competencies and skills at the third-year level is currently being designed and implemented by each clerkship.
- All students must pass a six-station OSCE to pass the Introduction to Clinical Medicine and proceed to the third year.
- Computers are used for testing in a number of preclinical and clinical core courses.
- Every student must be observed performing a complete history and physical by his or her attending physician during the core medicine clerkship.
- All students must be observed performing relevant portions of the physical examination during all other rotations. A field for inclusion of these data has been added to all clinical evaluation forms.
- The school has instituted standardized knowledge-assessment exams (the NBME subject examinations) in all of the required clinical clerkships where they are available.
- There is a separate evaluation system for professionalism in our clinical clerkships.
- There are two required clinical performance examinations, one in the middle of the third year for students' self-assessment of clinical skill progress and one at the beginning of the fourth year to assess attainment of core clinical competencies.

Clinical Experiences

- The school has an extensive clinical preceptorship program as part of the elective curriculum in the first two years. The preceptorships can be with full-time UCSD clinical faculty or with community faculty.
- Preceptorships are available in all the primary care disciplines, surgical subspecialties, emergency medicine, hospice care, geriatrics, HIV medicine, radiology, anesthesia, etc.
- Preclinical students, together with clinical students and

faculty, staff three school-sponsored free clinics at schools and churches in San Diego as part of the elective curriculum.

- For clinical students, there are myriad opportunities to practice in both university and community settings. The major teaching hospitals include a university hospital, a large community hospital affiliate, a Veterans Affairs Medical Center, a naval hospital, and a children's hospital.
- Students have the opportunity to work at the Indian Health Center Hospital in Tuba City, Arizona.
- Outpatient sites are equally varied and range from faculty practice clinics located in the community to local private practices staffed by volunteer faculty to the St. Vincent de Paul Shelter for the Homeless, which is staffed by UCSD health care providers.
- In the past ten years, there has been a significant shift to teaching in the outpatient arena.
- The faculty who teach in the required third-year longitudinal primary care clerkship are largely community-based.
- One month of the required three-month medicine clerkship is in the outpatient setting, and a number of both university and community sites participate.
- All of the third-year core clerkships have a significant outpatient component.
- During the six-week required psychiatry clerkship, students have the opportunity to work at the San Diego courthouse with a forensic psychiatrist.
- There are fourth-year elective rotations (in addition to all the usual ones) at the San Diego Hospice and with the county coroner.

Curriculum Review Process

- A process for curricular review has been in place since the school's inception, and it continues unimpeded, although modifications and improvements in the ways core courses and electives are reviewed have occurred over the years.
- Several years ago, UCSD had a series of educational retreats to which faculty and representative students were invited. These retreats focused on taking a broader look at our educational offerings.
- A number of themes emerged, which led to the formation of four joint faculty–student working groups: (1) increasing active learning, (2) enhancing clinical teaching, (3) improving evaluation of both faculty and students, and (4) enhancing faculty rewards for teaching. These groups produced many recommendations.
- The major faculty educational committees were then charged with approving and implementing the recommendations.
- Resources for the planning of the retreats came from the dean's office.
- With the success of the educational retreats, it was decided that the school should embark on an overall strategic planning process that involved research and clinical areas in addition to the educational mission.
- Unfortunately, this occurred at a time when energies were required for implementation of the recommendations from the educational task forces, which slowed that process. However, additional recommendations arose from the strategic planning process, and they are in the process of being implemented now.
- Many of the recommendations made by the initial educational task forces have been implemented, and others of these initial recommendations are also in the process of being implemented.
- Funds for implementing the changes are negotiated by the associate dean with the vice chancellor as the processes evolve.
- Many of the recommendations relating to education stemmed from comments made by both the students and the faculty about areas for improvement.
- The AAMC Graduation Questionnaire has provided a rich source of curricular information, and the school has been heartened to see improvements in areas measured by this instrument.
- As a result of recommendations from both the Educational Task Force and the strategic plan, there has been increased emphasis on faculty development, with a total of 70 sessions offered in 1998–1999 in the areas of teaching and learning, research, leadership, and resources needed for academic success. This represents an increase of 50% over previous years, affecting over 150 more faculty per year. Our efforts in faculty development have been greatly enhanced through a grant that established UCSD as a National Center for Leadership in Academic Medicine (NCLAM).
- The administration and presentation of these programs are through the Office of Learning Resources and the assistant dean for curriculum. Participation and feedback have demonstrated that these programs are very well received.
- This receptiveness represents a major culture shift within the institution.
- There are faculty committees charged with ongoing review both at the course level and at the broader policy level. Their continued vigilance and input are integral to the educational program, and they have catalyzed a number of changes.

Future Goals and Challenges

- Issues of resources for both undergraduate and graduate medical education will still be major problems that will need to be addressed in the next five years.
- The impact of technology on education and using technology to advance learning will also be major topics of discussion.
- Reducing medical errors and enhancing patient safety through better training at all levels will also be a major focus of our efforts in the coming years.

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University of California at San Francisco School of Medicine

HELEN LOESER, MD, AND DAVID M. IRBY, PHD

Curriculum Management and Governance Structure

- Governance of the curriculum resides with the Committee on Curriculum and Educational Policy (CCEP), which is a subcommittee of the school of medicine faculty council.
- Course committees for each year in the curriculum report to the CCEP, as do the curriculum reform ad hoc task groups. (See Figure 1.)
- A streamlined structure is being created to plan and implement the new curriculum.
- A single steering committee will oversee the block course committees for the first two years; another will oversee the clinical years.

Office of Education

- The Office of Medical Education was created with the arrival of the vice dean for education in 1997.
- The office is responsible for faculty development, curriculum development, instructional technologies, and educational evaluation and research.

Budget to Support Educational Programs

- With the arrival of the vice dean for education, all of the budgets for education were centralized.
- The budget is funded by state funds and resources provided by the dean.

Valuing Teaching

- A new program without walls is being created to support and reward teachers in the medical student education program.
- The Academy of Medical Educators is a highly selective, honorific organization that promotes teaching excellence.
- It is anticipated there will be 30 endowed chairs to support the core teaching faculty over the next five years.
- The academy will provide instructional improvement grants to faculty members involved in curriculum reform.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In 1998, the curriculum committee adopted a set of outcome learning objectives for the MD curriculum.
- Outcome learning objectives for UCSF graduates include (1) a capacity for self-evaluation and moral reflection to sustain a lifetime of responsible, committed, and compassionate practice of medicine; (2) a commitment to continued learning and to teaching patients and colleagues; (3) an understanding of the scientific foundations of medicine, with particular attention to common diseases and life-threatening emergencies; and (4) a mastery of the core clinical skills needed to evaluate and care for patients.
- Thirty outcome objectives were written and clustered under these goals.

Changes in Pedagogy

- Over the past decade, the trend has been to decrease class time, increase small-group learning, and increase the use of clinical cases.
- Some use of problem-based learning was also introduced in several courses.

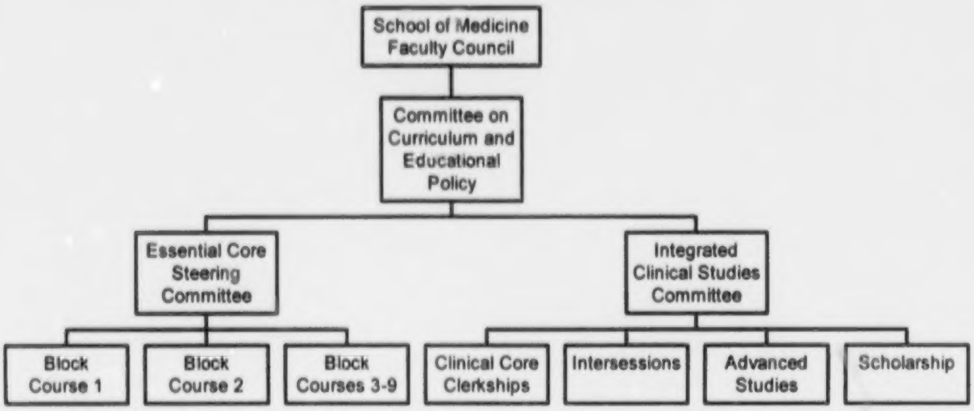
Application of Computer Technology

- Currently a few courses use instructional technologies.
- In the next two years, every course in the new curriculum will be Web-based and use new technologies.

Changes in Assessment

- Progressive and integrative evaluation will be part of

FIGURE 1: Curriculum Structure


School of Medicine Faculty Council
Committee on Curriculum and Educational Policy
Essential Core Steering Committee
Integrated Clinical Studies Committee
Block Course 1
Block Course 2
Block Courses 3-9
Clinical Core Clerkships
Intersessions
Advanced Studies
Scholarship

each block course in the soon-to-be established Essential Core curriculum.
- Individual clerkships will develop observed/objective formative and evaluative exercises.
- An end-of-third-year objective structured clinical practice examination is being implemented as part of the California Consortium.
- A comprehensive assessment plan is being created for the outcomes of the medical education program and the planned innovations.

Clinical Experiences

- Early clinical experiences were introduced throughout the first two years' curriculum in 1995. These experiences occur in longitudinal preceptorships in primary care settings.
- The clinical experience is complemented by an interdisciplinary course on clinical skills and professional development.
- A six-month longitudinal ambulatory clinical experience was initiated in the third year in 1999.

Curriculum Review Process

- Timeline for Curriculum Renewal
  - Curriculum reform began in 1998.
  - Recommendations will be implemented for the class entering medical school in September 2001.
  - Changes to the clinical core structure and requirements will be implemented in July 2000; an earlier beginning to the clinical core will debut in 2003.
- The curriculum will comprise three phases: Essential Core, Clinical Core, and Advanced Studies.
- The Essential Core will change the current parallel departmental basic science courses to eight integrated block courses, each with a set of key cases.
- In addition to the longitudinal clinical skills course (above), block courses will include: prologue; major organ systems (heart/lungs/kidneys); cancer; brain, mind, and behavior; metabolism and nutrition; infection, inflammation and immunity; life cycle, and consolidation cases. Medical anthropology, behavioral sciences, health policy, epidemiology, and preventive medicine will all be integrated across the eight blocks.
- Clinical Core requirements will be reduced to 44 weeks, will include elective time, and will begin and end in late spring.
- In addition to an introductory "preparation for the clerkships," four one-week intersessions (integrated classroom instruction) will be introduced between clerkship blocks for the whole class.
- Advanced Studies will include advanced clinical rotations, blocks for scholarly research and learning teaching skills; selectives in advanced anatomy electives; and preparation for internship.
- The school has utilized an iterative process of innovative work accomplished in small design groups, alternating with presentations to broader audiences (department chairs, department faculty meetings, course directors, CCEP, faculty council), along with frequent dissemination through newsletters, e-mail, and the Web. Students are engaged and involved in every work group and committee.

- Resources needed:
    - Basic science departments will continue to support stewardship of block courses in the Essential Core; clinical departments will do the same for much of the Clinical Core.
    - Centralized support will be required for curriculum innovation and leadership for clinical and social/behavioral science faculty working in the integrated curriculum, components of course administration, scheduling, electronic curriculum development, student assessment, and evaluation of the educational program.

Loma Linda University School of Medicine

LEONARD S. WERNER, MD

Curriculum Management and Governance Structure

- The associate dean for educational affairs coordinates the undergraduate medical education program.
- The associate dean reports directly to the dean of the school of medicine.
- The associate dean works closely with the curriculum committee, which is composed of faculty selected because of their educational expertise and interest.
- The curriculum committee is charged with planning, managing, and evaluating the educational program.
- There are three voting student members on the curriculum committee.
- The associate dean for educational affairs keeps the curriculum committee informed about outcomes assessment.
- Two additional faculty members work closely with the associate dean to help coordinate and manage the clinical educational program.
- An assistant to the dean for information technology, a director for clinical skills development, and several faculty composing the clinical skills assessment lab support the associate dean.
- The associate dean appoints the basic science course directors and the clinical science clerkship directors to their positions upon the recommendation of their respective department chairs.

Budget to Support Educational Programs

- The associate dean oversees distribution of support monies designated for the clinical science course directors to support their educational function.
- The support monies are derived from student tuition dollars.
- The associate dean determines the allocation of tuition-derived support monies for the basic science departments based on the quantity and the quality of teaching done by each department. The curriculum committee determines the quantity of teaching time.
- The associate dean has a budget to run a clinical skills assessment program that consists of end-of-clerkship OSCEs and a school-wide, eight-case standardized-patient exam.
- This budget is supported through tuition dollars and was established specifically by the dean for its designated purpose.

Valuing Teaching

- Over the past five years, an increasing number of faculty have become involved in medical student education through small-group active-learning/problem-based learning activities that run throughout the first year.
- Each year a faculty member is honored as teacher of the year.
- Past teachers-of-the-year evaluate other faculty having significant teaching loads.
- Basic science course directors evaluate all faculty in their respective courses and forward these evaluations to the dean's office and the curriculum committee.
- The dean uses student evaluations of faculty, course director evaluations of faculty, and master teacher evaluations of faculty as the bases for promotion and tenure.

CURRICULUM RENEWAL PROCESS

Changes in Pedagogy

- The school offers a modified traditional curriculum using lecture, small-group discussion, problem-based learning, and computer-based learning activities, but the uniqueness of the educational program at Loma Linda relates specifically to its emphasis on whole-person care and the formation of Christian physicians.
- As part of the whole-person curriculum, students examine the role of medicine as a partner with God and the healing of mankind and examine the knowledge, values, attitudes, and skills for maximizing the process of being a whole person as a physician.
- Students investigate Christian medical ethics as applied to the personal integrity of the physician and the procedures for moral decision making in ethical problems facing contemporary medicine.
- During the past five or six years, the curriculum has become considerably more integrated across department lines and much more directed at using outcomes assessment to determine changes in curriculum.

- By financially supporting basic science departments and clinical course directors, the dean's office has become more central in being able to influence curricular decisions and, more specifically, to implement curricular innovations.

Application of Computer Technology

- Students are not required to have computers but are entitled to receive loans if they desire to buy them.
- There are two computer learning centers in the school, one designated for basic science education and one for clinical science education.
- The centers are supported by an assistant to the dean for information technology and a development staff of three people.
- Computer software has been developed on campus to support teaching heart sounds in the physical diagnosis course, and various software programs have been brought in from outside sources to support teaching in a number of the basic science courses.

University of Southern California Keck School of Medicine

ALLAN ABBOTT, MD, JOEL SCHECHTER, PHD, AND DONNA ELLIOTT, MD

Curriculum Management and Governance Structure

◆ The school is undergoing major curriculum renewal, as described below.

Office of Education

◆ For many years there was an Office of Medical Education.
◆ There is currently a Curriculum Office.

Valuing Teaching

◆ The school is presently not oriented to identifying faculty whose primary responsibility is in the medical student education program.
◆ However, the Curriculum Office works with individuals from the respective departments, and therefore individuals whose primary responsibility is in medical education can be identified in that way.
◆ The third-year required clerkships are department-oriented, so education-oriented faculty are identified in this regard.
◆ The curriculum is under revision, and chairs are appointed centrally for all systems.

CURRICULUM RENEWAL PROCESS

A major process of curriculum revision is now under way in the Keck School of Medicine under the direction of a Curriculum Revision Coordinating Committee (CRCC). This committee is composed of basic scientists, clinicians and representatives of medical education. The CRCC, in conjunction with the Educational Policy Committee, is going forward with plans to completely revise the medical curriculum. The target date for implementation of the new curriculum is fall of 2001.

The schedule as now proposed begins with core principles of health and disease, followed by organ systems emphasizing function/dysfunction, and continues into the second year. The second year ends with an integrated case-study approach to health and disease, a sequence of carefully designed cases that will require students to integrate their knowledge and competencies in the basic and clinical sciences. Introduction to Clinical Medicine (ICM) will continue throughout the first two years of the curriculum, providing additional opportunities for correlations between basic and clinical sciences. Cadaver dissection will take place in the beginning of the first year, although additional instruction in gross anatomy will be a component of each organ system during the first two years of the curriculum.

Learning Outcomes

◆ The Educational Policy Committee of the school has established and reviewed educational objectives.
◆ The curriculum is linked to the objectives.

Changes in Pedagogy

◆ Case-based teaching will be an integral part of the new curriculum. The cases and their associated basic science and clinical learning objectives will be integrated throughout the curriculum in a coordinated manner, thus facilitating the realignment of content in specific subject areas with cases in a manner that emphasizes and reinforces the clinical relevancy.
◆ The new curriculum will have decreased lecture time and increased small group teaching.
◆ The new curriculum will have increased opportunities for student self-directed study.
◆ Standardized patients will be used for teaching and assessment in all years of the new curriculum.

Application of Computer Technology

◆ All students in years one and two have been provided with high-speed connectivity to the Internet, including state-of-the-art computers in all 15 multidisciplinary laboratories.

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- All year-one and year-two students have computer accounts, including individual e-mail accounts and productivity software.
- Web-based learning materials will continue to expand for all four years of the curriculum. At present approximately 90% of the learning materials presented to year-one and year-two students are already available in Web format on the Internet (http://medweb.hsc.usc.edu), including all visual materials (classroom and laboratory slides) in pathology, microanatomy, and microbiology, and all learning objectives, and lecture handouts for all courses.
- Practice questions in a variety of basic science disciplines and numerous clinical case vignettes are already available on-line and will continue to expand.
- An extensive Web-based database of clinical cases to be used in the new case-based curriculum is currently under development.

Changes in Assessment

- Evaluation of faculty by students is now done by computer.
- Computer-based examinations are being considered.
- There is direct faculty observation of student performance in ICM and in OSCEs.
- Clerkships conduct OSCEs.
- All third-year students are required to pass a rigorous OSCE prior to graduation.
- All second-year students are required to pass an OSCE in ICM.

Clinical Experiences

- Students have a broad range of clinical experiences in physicians' offices, clinics, and wards of public and private hospitals.

Curriculum Review Process

The overall design of the present school of medicine curriculum was established in 1969, and, although updated annually, it has never undergone systematic review and revision. During the subsequent 30 years there have been (1) enormous increases in medical research and an explosion of medical knowledge, (2) increasing specialization in medicine, (3) new emphasis on molecular medicine, genetics, medical informatics, ethics, evidence-based medicine, and more, and (4) revolutionary changes in financing and delivery of health care. Given this changing environment, the challenge of curriculum revision is to reconsider what, when, and how to teach, knowing it is clearly impossible to cover all that might be learned about medicine in four years of medical school.

- The LCME accreditation in 1991 noted a need for curriculum revision, and again in 1997 the LCME cited as a deficiency a lack of systematic review and revision of the overall curriculum. Specific points noted by the 1997 LCME report were:
  - There was no effective formalized system to review and coordinate the curriculum as a whole.
  - The curriculum was not sufficiently guided by overarching principles.
- The medical school faculty and administration have responded positively to the need for curricular reform.
- In recent years, several groups within the medical school made recommendations regarding curricular revision (Blue Ribbon Task Force on Medical Education, Curriculum Revision Subcommittee of the Year I–II Curriculum Committee, and the Curriculum Revision Implementation Planning Committee).
- These groups emphasized the need for thorough review and revision of the curriculum with attention to certain areas as described below.
- As a result, a number of distinct steps were taken toward curriculum revision:
  - In 1998, the Curriculum Revision Subcommittee was appointed as a subcommittee of the Year I–II Curriculum Committee. This committee considered local and national recommendations regarding curriculum and designed an overall plan for curriculum revision in the first and second years, and presented its plan in March 1999.
  - In July 1998, the Case-Based Education Committee was appointed and faculty development of the Student Practice Profile Project was initiated.
  - In April 1999, the Year I–II Curriculum Committee reviewed and approved the Curriculum Subcommittee proposal.
  - In May 1999, the Educational Policy Committee approved the new curriculum design.
  - In July 1999, the Curriculum Revision Implementation Planning Committee was appointed and charged with developing a plan and timeline for curricular revision and implementation.
  - In October 1999, faculty retreats for curriculum revision were held. Through large- and small-group discussion drafts were developed for (1) content of core principles section, (2) sequence of systems, and (3) criteria for determining content of systems and inte-

  - grated case-based sections of the new first- and second year curriculum.
  - In November 1999, financial support for implementation was confirmed by the Dean and the Finance Committee.
- In addition, the school's educational objectives were revised and approved by the Educational Policy Committee in September 1999.
- The plans for curricular revision are based upon the following goal and overarching principles:
  - Overall curriculum goal:
    - —The new curriculum will provide a generalist education that will prepare graduates to enter any specialty.
  - Overarching principles:
    - —To facilitate achieving the goal, the school has been developing an innovative Student Practice Profile Project.
    - —The Student Practice Profile Project, a collection of carefully designed clinical cases that represent the most common and important problems in all medical specialties, is being written by the collaborative efforts of USC faculty.
    - —The Student Practice Profile Project will thus serve as an overarching mechanism by which to organize and integrate the four years of the new curriculum.
- The cases and their associated basic science and clinical learning objectives will be integrated throughout the curriculum in a coordinated manner, thus facilitating the realignment of content in specific subject areas with cases in a manner that emphasizes and reinforces the clinical relevancy.
- The overarching principle is therefore the enhanced integration of basic science education into clinically relevant medical education.
- The expected outcome is that graduating students will have learned all clinical and basic science aspects of the student practice profile, i.e., competency as a generalist physician, and will be appropriately prepared to pursue further training in the area of medical specialization of their choice.
- Core features of the new curriculum:
  - A careful assessment of each portion of the new curriculum will be conducted.
  - This assessment will be aided by a committee charged with ongoing evaluation to ensure that the curriculum provides a comprehensive and appropriately balanced generalist curriculum.
  - A core principles of health and disease section will begin in the first year and provide the basis for study of the systems.
  - Case-based learning will be emphasized throughout the curriculum, beginning on day one of medical school as a consistent and integral part of the curriculum.
  - Systems will integrate study of normal human functions, biology, anatomy, physiology, and health, with study of dysfunctions, mechanisms of disease, and diseases.
  - There will be less lecture time and more problem solving and small-group teaching.
  - There will be more use of computer-based self-directed learning.
  - There will be increased emphasis on professionalism and on evidence-based medicine.
  - A section of integrated patient-centered problems will complete the second year.
  - An organizational structure centered on the faculty directing the courses that does not center on the traditional departments will be created.

Future Goals and Challenges

- Planning will proceed according to the proposed timeline with the new curriculum being initiated in 2001.
- A comprehensive review of the third and fourth years of the curriculum will take place.
- A program evaluation committee will be established to review the revised curriculum on an ongoing basis.
- A centralized student evaluation committee will be established with the Curriculum Office to review and coordinate examinations and student evaluations.
- A central curriculum committee will coordinate the curriculum and a curriculum oversight committee will be established.

Stanford University School of Medicine

PHYLLIS GARDNER, MD

Curriculum Management and Governance Structure (see Figure 1)

- ◆ The required curriculum was established in 1983, with responsibility for the education program vested in the faculty through the faculty senate, which has standing committees for curriculum, admissions, student performance, and medical scholars.
- ◆ The decanal oversight of the curriculum initially resided with the associate dean for academic affairs (who basically handled faculty affairs and little related to curriculum).
- ◆ Serving as a parallel governance structure to the faculty senate process, the Office of Medical Education (OME) was created and expanded during the past decade (see Figure 1).
- ◆ The curriculum is currently managed by a standing faculty senate committee, the Committee on Courses and Curriculum (CCC), with parallel oversight and support by the OME.

Office of Education

- ◆ As described above, the OME was established in 1990. It was expanded to the current five FTEs during the subsequent decade.
- ◆ Notable changes were the creation of an associate dean for medical education (initially a 0.5 FTE in 1992, expanded to a 1.0 FTE in 1999) and the creation of a standardized patient program in 1994.
- ◆ Over the years, the role of the OME has grown to include monitoring curriculum quality, working to improve problem courses and clerkships, encouraging innovation in all aspects of curriculum, and assuring effective implementation of new programs and changes.

Budget to Support Educational Programs

- ◆ The OME is supported with a distinct annual budget, derived from the operating budget of the school of medicine.
- ◆ In addition, there are at least two other important programs responsible for aspects of medical education.
  - SUMMIT, the learning technologies unit described below, is supported by the operating budget and outside grants.
  - The Medical Scholars Program, which oversees the five-year program for students pursuing in-depth re-

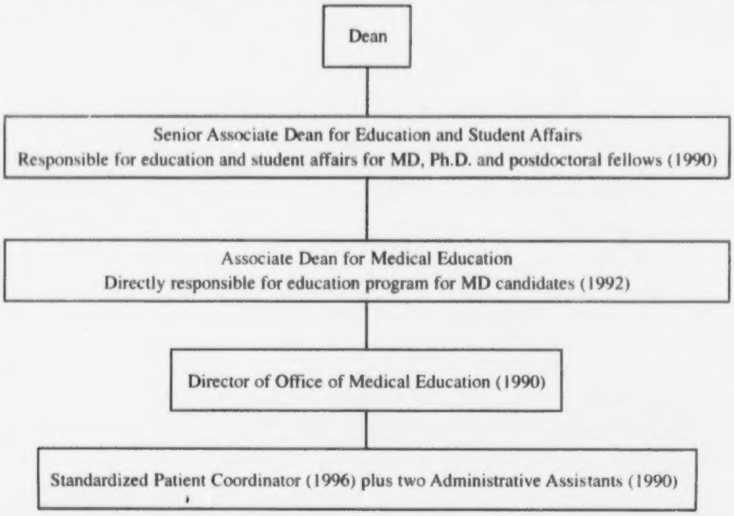
Dean
Senior Associate Dean for Education and Student Affairs
Responsible for education and student affairs for MD, Ph.D. and postdoctoral fellows (1990)
Associate Dean for Medical Education
Directly responsible for education program for MD candidates (1992)
Director of Office of Medical Education (1990)
Standardized Patient Coordinator (1996) plus two Administrative Assistants (1990)

FIGURE 1: Governance Structure, Office of Medical Education

Note: The years indicate when the positions were created.

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search in one of several specified areas (life sciences, arts and humanities, public service, enterprise, biomedical engineering), is supported through development funds.

Valuing Teaching

- Course evaluations, including evaluations of individual lecturers, are collected for every course and reviewed quarterly by the CCC. Lecturers receiving poor ratings are mentored by the course director. If performance improvement is not demonstrated, the lecturer is removed from the course.
- In addition, an internationally renowned scholar in the area of faculty development uses techniques such as self- and peer-assessment via videotaping to individually evaluate and improve faculty teaching skills, with demonstrable improvement. During the past decade, this scholar has been working with Department of Medicine faculty and residents.
- Following the educational retreat in 1999, which initiated the current ongoing curriculum reform, this scholar began working towards the expansion of this program of improving teaching skills to make it available to all faculty in the school of medicine.
- There are three named teaching awards presented annually at graduation.
- Teaching is recognized through the same appointment and promotion process that evaluates research, education, and clinical contributions.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The senate of the faculty council has adopted nine fundamental educational objectives for students enrolled in the MD degree program. These are found on page 28 of the 1999 school of medicine catalog and also are available from the author in the online catalog: (http://www.med.stanford.edu/school/catalog).

Changes in Pedagogy

- The school has employed numerous innovations in the past ten years to enhance medical student education. Highlights of these innovations include the following.
    - Novel teaching methods are used to develop clinical skills early in medical training and to introduce the student to the principles of clinical reasoning.
    - Several new courses have been implemented early in the curriculum (years 1 and 2) to develop the student's skills in patient interviews, clinical examination and diagnosis, and clinical reasoning. The Physicians and Patients course, given in the first year, emphasizes patient interview skills, focused readings, and discussion of ethics in medicine, and begins the integration of basic science with clinical medicine.
    - Several of the "vertical threads"—multidisciplinary concepts taught within the context of several courses (see below)—are initiated in this course. In the spring of the first year, students learn the principles of the psychiatric interview.
    - In the second year, students enroll in the Preparation for Clinical Medicine series, which includes developing skills in the physical examination, improving skills in the patient interview, and practicing clinical presentation in one-on-one settings with a faculty preceptor.
    - A significant portion of the spring of the second year is devoted to clinical reasoning and problem-solving exercises in which students meet daily in groups of ten to 12 with faculty "facilitators" to engage in problem-based learning (PBL) cases, discuss clinical-pathologic correlations, and be challenged by clinical dilemmas using multistation exercises.
    - Six vertical threads—multidisciplinary concepts taught within the contexts of several courses—have been developed in the areas of cross-cultural medicine, human sexuality, medical ethics, nutrition, disease prevention and health promotion, and substance abuse. These threads provide students with a foundation in these important, but sometimes overlooked, topics in medicine. The use of vertical threads also makes possible an integrated approach to teach principles of medicine important to the new physician.
    - There is an increase in the use of a digital curriculum, including use of Web-based instruction, Web-based teaching exercises and review materials, and computer simulations of teaching cases.
- Currently, all of the required courses during years 1 and 2 are available on the Web site of the Stanford University Curriculum Web Project (CWP). Lectures are recorded using streaming video, which allows high-resolution capture of the lectures and their materials. In addition, the syllabus, problem sets, reading materials and references, and useful links to other sites are available for each course on the CWP. For certain electives

(e.g., the Human Nutrition course), an entirely digital [illegible] is available, which allows students the flexibility [illegible] the course at any time (and almost anywhere) during their tenure in medical school.

- The school has made increasing use of standardized patients in the past ten years to evaluate students and to assure progress in achieving adequate clinical skills. Students are evaluated during the course of several of their core clerkships to measure their progress and to suggest improvement, if necessary.
- All students are encouraged to specialize or pursue in-depth research, either through joint degrees (MD–PhD, MD–ME, MD–JD, MD–MBA) or through a fifth year of research that is fully funded by established scholarships.
- Med Scholars are proposed by students, generally in their preclinical years, and evaluated by one of several standing faculty committees (i.e., those on Life Science Scholars, Arts and Humanities Scholars, Public Service Scholars, and Enterprise Scholars).

Application of Computer Technology

- Students are not required to have computers, as computers are available 24 hours a day in the learning lab.
- Computer-based technology is pervasive in the Stanford environment. However, computer-based technology is regarded as a valuable supplementary educational modality to direct interpersonal exchange. There are several applications of computer-based technology, which are created and overseen by a distinct academic unit called SUMMIT, with a director who works with five PhD and master's-level FTEs plus numerous computer science and medical students.
- The Curriculum Web Project (CWP) site is password-accessible and contains extensive course material, including course schedules, handouts, supplementary study material, and old exams. Within 24 hours, all lectures and seminars are available at the site by streaming video.
- SHINE is a unique knowledge domain of integrated published medical materials (textbooks, drug databases, PubMed, guidelines, specialized content, full-text journals) and was created within the Office of Continuing Medical Education over the past five years.
- Using SHINE, one can enter a question or concept, deploy an integrated indexed search over the entire body of digital material, and receive a response within eight seconds or less. The domain is unique in that it allows learner-initiated and learner-controlled searching of scholarly medical material. The integration of the search and the unique indexing allow "just-in-time" information to be derived.
- SHINE (currently being commercialized as a product called e-SKOLAR) is available through password access over the Web and is extensively used by medical students.
- Stanford has just instituted a required one-hour course in nutrition that is entirely computer-based. The course may be taken at any time over the four- or five-year period of the MD degree. It spans the disciplines from biochemistry to pathophysiology and clinical cases and employs interactive methods, including virtual labs. In addition, there are several computer-based courses that are supplemental, such as BRAINSTORM, a neuroanatomy program.
- The school is actively involved in the creation of simulated training environments. A simulated operating room for anesthesia training was developed and is available at the Palo Alto Veterans Hospital. The chair of surgery has developed a simulated bronchoscopy trainer. This was commercialized by HT Medical, and a unit is now available at the school. Faculty are developing a variety of simulations, including several other simulated surgical training environments and a simulated female pelvis with haptic feedback for instruction in female pelvic examination. This is used in the Preparation for Clinical Medicine (PCM) course.
- In addition, a commercial IV simulator with haptic feedback was just purchased, and it will be used to train students in the procedure of intravenous access in the PCM course.
- The school is engaged in a joint research endeavor with the Karolinska Institute of Stockholm, Sweden, to develop a battery of ISPs (interactive simulated patients).

Curriculum Review Process

- Ongoing review of the current curriculum is overseen by the CCC and the OME, with extensive evaluation of all courses conducted on an annual basis.
- An institutional curriculum review was last performed for LCME certification in 1997.
- In 1999, a school-wide off-site retreat for faculty was held to assess the status of education at the school of medicine. This initiated the current curriculum reform effort described below. Several fundamental questions are being addressed, including:
  - What is the required "core" curriculum?
  - What is the appropriate mix of pedagogic methods (lectures versus small seminar, incorporation of case-based or problem-based learning tools, inclusion of

  vertical threads topics, use of computer technology and simulated training environments, independent research)?
  - What is the appropriate timing and sequence of the integration of clinical with preclinical material?
  - What is the appropriate mix of hospital-based versus ambulatory clinical care?
  - What is the institutional commitment for faculty development in teaching, as well as the role of teaching and education in the appointment and promotion processes?
- Curricular reform that spans the preclinical, clinical, and graduate curricula and training programs is in progress at the medical school.
- The flagship Medical Scholars Program, which provides students with full fellowship support to design and conduct independent research in the laboratory, clinic, and community and to gain front-line experience in the biotechnology/business sector, is also being redesigned to provide students with greater opportunities for rigorous and intensive immersion in scholarship.
- Goals for the curricular reform were identified at the education retreat in February 1999. These include an emphasis on critical thinking; integration of medical and graduate student education; and bilateral integration of basic, translational, and clinical sciences.
- The students' professional needs and goals are being significantly affected by the changing structures of both medical research and clinical practice. Accordingly, in the fall of 1998, faculty began to identify the strategic shifts that the school must implement to prepare graduates to practice medicine well into the 21st century.
- Emerging technologies in genomics and medical informatics that are transforming diagnostics and therapeutics are of special interest.
- The new curriculum will provide students with the broad range of skills necessary to initiate and adapt to continuous change and to assume positions of leadership as medical scientists in academic medicine, the community, and industry.
- The curriculum reform coincides with the school's major architectural renovation of the library, classrooms, and administrative offices.
- The technologic infrastructure under design will support implementation of novel modes of learning and course delivery, some of which are already in place (for example, computer-simulated haptic diagnosis; videotaped interviews with and exams of standardized patients; international, cross-cultural synchronous and asynchronous problem-based collaborations; videoconferencing; and classroom access to digital libraries).
- A faculty development program to enhance classroom-based skills, promote active learning, and focus on teaching principles rather than facts is also under design.
- The new curriculum will be rolled out in phases. The redesigned Medical Scholars Program is already in place.
- It is anticipated that a significant part of the required undergraduate curriculum will be taught during academic year 2001–02. The new curriculum will stand out in two areas: 1) the use of advanced computer-based learning technologies to supplement (not replace) current interpersonal instruction, and 2) the encouragement of independent scholarship through the Medical Program Scholars or combined degrees in order to foster critical thinking and the development of leadership.
- The barriers encountered are predictable: innate resistance to change by course directors, lack of faculty time to address the issues in a truly efficient fashion, and a method of tuition disbursement to departments that strongly reinforces the maintenance of the status quo.
- There is a strong, collective interest on the part of faculty and students to modernize the curriculum and differentiate it in a uniquely Stanford way.
- Support for the curricular reform effort comes through a dedicated budget derived from the operating budget.
- A director of curricular reform (at the PhD level) and an associated administrative assistant have been hired to work with a standing faculty steering committee and decanal staff to accomplish this effort of curriculum modernization.

University of Colorado School of Medicine

GERALD B. MERENSTEIN, MD

Curriculum Management and Governance Structure

- The governance and management structure of the school has undergone significant changes since 1990.
- Prior to 1988 department chairs and basic and clinical science committees provided curriculum oversight.
- In 1988 a curriculum committee, consisting of chairs or their designees and one student from each class, was formed to initiate curriculum change. This consisted mainly of approving new elective courses and occasionally adding new requirements or approving changes in existing courses.
- The curriculum review committee, with six members elected by the faculty senate, and the curriculum committee, with four student representatives, were responsible for ongoing review of individual courses/clerkships.
- In 1991 a student course representative system was established to assist in review of courses, and in 1994 a medical student curriculum committee was formed to review the reports of the student representatives.
- At a retreat sponsored by the dean in 1997, the dean and the faculty agreed on the establishment of a position for a senior associate dean of education responsible for the oversight of student-related areas including admissions, student advocacy, affairs, advisement, and curriculum.
- Consistent with the recommendations of the retreat, the new dean of education formalized and funded separate committees for the first-, second-, and third-year course/clerkship directors.
- In conjunction with the curriculum committee chair, the dean of education also established two standing subcommittees. This included an informatics committee to make recommendations to improve the utilization of modern informatics in the curriculum and other student areas, and the MS IV committee, charged with developing continuing integration of clinical and basic science education in the fourth year.
- After several attempts to reorganize the curriculum committee, the dean of education appointed a committee to make specific recommendations. Based on these recommendations the curriculum committee, faculty senate, and department chairs approved a new structure in 1999.
- The curriculum committee and the curriculum review committee were combined into a single committee with a chair appointed by the dean. One faculty member is appointed by the faculty senate and two each are appointed by the first- and second-year course directors and four by the combined third-year clerkship directors and MS IV committee. Five students appointed by the Medical Student Council represent each medical school year and the MSTP (PhD/MD) program.
- This places the responsibility for curriculum oversight and review in the hands of those most directly involved in medical student education.
- The dean of education is sponsoring a curriculum committee retreat open to all faculty and students in April 2000. This retreat is to define the goals and objectives in the educational program for the MD degree and to develop an agenda for the curriculum committee for ongoing improvement of the education for medical students.
- In addition to the five standing committees, four additional committees were established for the retreat. These include new educational initiatives, electives in the curriculum, physician scientists and academic careers, and first- and second-year essentials.

Office of Education

- The centralized Educational Support Services of the Health Sciences Center campus provides excellent logistical support for classrooms, audiovisual equipment, and testing.
- In 1995 a separate office of education was established to provide support to the educational programs and faculty consultative services on instructional design, development, and evaluation.
- The dean of education and the director of the Office of Education (OE) have successfully worked together so that the OE functions clearly as the the school medicine's OE, including support for the AAMC's Curriculum Management and Information Tool (CurrMIT) and curriculum management, course syllabi, OE faculty support for student course representatives, the curriculum committee, and all retreat committees.
- The OE is funded by the HSC Chancellor's Office (school of medicine 40% equivalent contribution).

Budget to Support Educational Programs

- A discrete budget for the overall educational program does not exist.
- Central funds have been utilized for special school-wide programs, such as the Primary Care Curriculum (PCC) and student retreats.
- State educational dollars are distributed to departments. Some, but not all, departments track these monies to educational activities.

Valuing Teaching

- Faculty responsible for medical student education are identified and rewarded in various ways by their departments.
- In 1998 rules for tenure and promotion were revised, separating the two processes.
- Individuals are now eligible for promotion when documenting excellence in education and teaching and meritorious performance in clinical and scholarly activities.
- In 1995 Bridge to the Future (now Total Learning Environment) Awards and mini-grants were established to recognized innovations in education.
- Annually, a faculty member is selected by the senior class to receive the President's Award for Teaching Excellence and the medical student council selects one faculty member for the Chancellor's Teaching Recognition Award.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In the first and second years individual courses have learning objectives, but there are no overall objectives for these years.
- The third-year clerkship directors have identified competencies (learning outcomes) that students will be expected to demonstrate at the completion of the core clerkships.
- The process for determining the outcomes was a collaborative one that took two years of sharing what was done in the third year and then coming to consensus about what was essential.
- There are currently no curriculum-wide learning objectives for the medical students.
- The new initiatives committee identified a set of curriculum-wide objectives to present at the April 2000 retreat.

Changes in Pedagogy

- There have been many changes to the educational program.
- The most remarkable innovations in the curriculum have been initiated through the Primary Care Curriculum (PCC).
- The PCC, launched in 1994, is a three-year office-based preceptorship and primary-care–oriented curriculum.
- Since the Introduction to Medicine course was replaced by the PCC, physical examination and communication skills have been incorporated into the PCC.
- Communication skills are taught in many venues, including Bayer Institute for Health Care Communication workshops and in PBL with standardized patients.
- PCC uses standardized patient PBL during the first and second years.
- During year three students participate in small-group sessions addressing issues related to professionalism.
- Standardized patients are utilized in the PCC to assess physical examination and communication skills and professionalism. They are also used in the family medicine clerkship for assessment, and planning is under way for their use for assessing the third-year essentials.
- The pediatrics clerkship used interactive computerized patients for assessment.
- The Colorado Commission on Higher Education has designated the MD degree program a program of excellence, based largely on the PCC.
- Clinical correlates or case-based instruction are used in many of the basic science courses, including anatomy, embryology, genetics, microbiology, pharmacology, and pathophysiology.
- The microbiology, pharmacology, and pathophysiology courses coordinate the teaching of infectious diseases.
- Physiology has implemented small-group learning sessions in the ICU setting to supplement animal laboratories in cardiovascular, renal, and pulmonary physiology.
- In the first year medical students participate with nursing, pharmacy, PT, and PA students in an interprofessional course called Ethics in the Health Professions. Although there are some lectures, the course is primarily taught in small groups.
- An interprofessional course in professionalism is being planned.
- Electives on the nature of illness and hospice experiences in the fourth year promote understanding of end-of-life issues, spirituality, and culture.

- A basic science course in nutrition in the first year is supplemented by clinical electives in nutrition.
- In order to help with periods of transition the school has developed three student retreats, held in the mountains. The first retreat focuses on the transition to becoming a medical student, the second on preparing for traditional clinical rotations, and the third on transitioning to residency.
- There is a required one-week (soon expanding to two) transition-to-the-third-year course held at the start of the third year. There is also an elective transition to residency in the fourth year.
- The transition to residency emphasizes an integration of clinical and basic sciences.
- A subinternship, in any specialty chosen by the student, must be completed during the fourth year to better prepare the student for residency training.

Application of Computer Technology

- Students will be required to have computers by 2002.
- The use of computer technology has been fragmented and incremental.
- It is hoped that the recommendations of the informatics committee to the curriculum retreat will provide better organization for the use of computer technology in the future.
- Current uses include universal e-mail, Web, and database access for all students and faculty.
- Access to computers is available in the HSC library, in an eight-station medical student computer lab, and in two 12-computer classrooms available 24 hours a day.
- Some courses such as embryology and the PCC rely heavily on e-mail communication. Embryology, immunology, and the PCC utilize Web sites and linkages.
- Immunology and cell biology are using computer animation.
- The pediatrics clerkship is utilizing computer-based standardized patients, and embryology will utilize on-line testing.
- Pediatrics and family medicine are using on-line student, faculty, and course evaluation and plans are to have all courses and clerkships using online faculty and course evaluation for the 2000–2001 academic year.

Changes in Assessment

- The state legislature, recognizing the importance of assessment, has funded the Center for Studies of Clinical Performance. This center will be located at the new 217-acre UCHSC campus at the former Fitzsimons Army Medical Center.
- The center will have 24 standardized-patient rooms, including 18 outpatient, two inpatient, and four consulting rooms. Computerized testing facilities will also be present. The center will be equipped with state-of-the-art monitoring and recording capabilities. It will open in the next two to four years.
- Recognizing the importance of assessment, the dean created a new position for an associate dean for educational development and assessment in 1999.
- The PCC uses standardized patients, faculty observation, OSCEs, and computerized testing to assess students' knowledge, skills, and behaviors.
- Some of the clerkships also use standardized patients and computerized testing to assess competencies of students, although they are now in piloting phases.
- The family medicine and psychiatry clerkships collect log data to assess the clinical learning experience.
- The third-year clerkships still mostly use faculty observation.
- The school piloted an end-of-third-year OSCE clinical practice exam with five stations within the PCC last year.
- The clerkship directors participated in the development of the cases for the OSCE assessment.
- This year the school will be an NBME Board testing site and will contribute some cases developed at the school.

Clinical Experiences

- Students begin seeing patients in a primary care physician's office in the first year.
- The longitudinal preceptorship continues for the first three years and can be continued for an elective fourth year.
- Near the end of the first year students have an ICU observational experience as a supplement to their physiology laboratories.
- Starting in the first year students may elect to work in clinics providing care to homeless people and patients who are recovering from substance abuse or dealing with domestic violence.
- Students have increasing responsibility in these clinics as their knowledge and experience increase.
- During the summer between the first and second years, students may elect to spend time in rural primary care (family or internal medicine) offices supported by AHEC sites.
- During the third-year core clerkship there has been in-

creasing utilization of office-based experiences in most of our required clerkships, including serving the entire clerkship in an AHEC site.

- Throughout the third and fourth years students see patients in clinic and ward settings, faculty and private practice office settings, ORs, psychiatric hospitals, rural offices and hospitals, community health centers, prisons, and clinics for underserved populations.

Curriculum Review Process

- The curriculum committee reviews individual courses on a three-year cycle. Usually these reviews result in small changes to existing courses.
- To instigate curriculum renewal the administration, faculty, and students have used the retreat format.
- The initiation of the PCC followed a 1994 retreat, and the creation of the dean of education position and the restructuring of the curriculum committee followed a 1997 retreat.
- The dean of education sponsored a curriculum committee retreat for curriculum renewal in April 2000. The retreat was held to define the goals and objectives of the educational program for the MD degree and develop an agenda for change for the curriculum committee for ongoing improvement of medical education.
- As described above, nine committees reported at the retreat. The dean of education appointed the chairs of these committees in consultation with the dean. Committee members were selected from recommendations of department chairs, the faculty senate, the curriculum committee, and the medical student council.
- The new initiatives committee will identify a set of principles that will be the basis for evaluation of current courses and for the development of future programs; define the data needed for ongoing evaluation of the curriculum for appropriateness and timeliness; place in the curriculum learning activities congruent with the goals and objectives of the school of medicine; and suggest an ongoing process for total curriculum review.

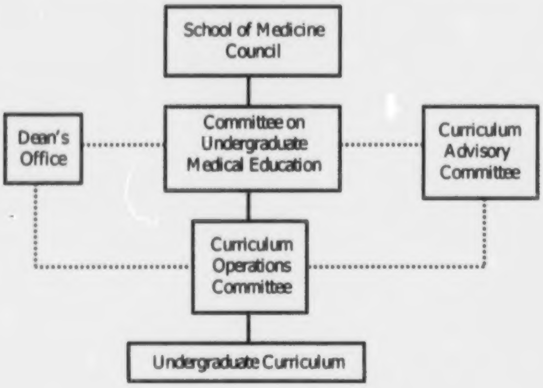
University of Connecticut School of Medicine

BRUCE KOEPPEN, MD, PHD

Curriculum Management Governance and Structure (See Figure 1)

- Prior to 1990, the governance structure was more fragmented. The School of Medicine Council had by-law authority over the curriculum. However, there were two policy committees: one for the first two years, and one for the last two years. Separate operations committees existed for each year of the curriculum. Within this structure, there was little communication between the various committees. As a result, it was not possible to manage the curriculum in a coordinated and coherent manner.
- The governance structure was established just prior to implementation of the new curriculum (May 1995). It is designed to provide a mechanism for addressing issues related to policy, operations, oversight, curriculum evaluation, strategic planning, and educational innovation. Moreover, it attempts to link responsibility for the curriculum with the authority to effect appropriate and necessary changes in the educational program.
- The structure reflects and supports the multidisciplinary structure of the new curriculum, and provides broad representation of important stakeholders in the educational program.
- Representation within the governance structure includes faculty, students, and members of the dean's office staff.
- The by-laws of the school invest the faculty, through the School of Medicine Council, with oversight of the educational programs, making them responsible for overseeing the general form and content of the undergraduate curriculum, and assuring its quality.
- The faculty council is a representative body of the faculty with membership from each of the departments, as well as several members elected at large from the full-time faculty.
- A standing committee of the School of Medicine Council, the Committee on Undergraduate Education, is the primary educational policy-making body. It develops policies for all aspects of the undergraduate curriculum, and its recommendations are sent to the School of Medicine Council for ratification. Its responsibilities include: providing regular oversight of the educational program; ensuring periodic review of the educational program; receiving recommendations from any constituency regarding all medical student educational policy; developing plans and policy proposals concerning curricular organization, student evaluation, and all other student-related academic issues; initiating and overseeing strategic planning for the educational programs; assessing long-range needs regarding the direction and evolution of the educational program; and exploring and evaluating trends in medical education.

FIGURE 1: Curriculum Governance Structure


School of Medicine Council
Dean's Office
Committee on Undergraduate Medical Education
Curriculum Advisory Committee
Curriculum Operations Committee
Undergraduate Curriculum

- The dean for academic affairs and education chairs this committee, and faculty membership is by appointment.
- The committee also has student representation, with one student representative from each of the second-, third-, and fourth-year classes. Their peers elect the student representatives.
- The Curriculum Operating Committee reports to the policy committee and deals primarily with operational issues related to the undergraduate medical curriculum. Its responsibilities include: developing yearly academic calendars; integrating and coordinating the presentation of material throughout the curriculum; suggesting needed policy changes; considering issues and innovations in curriculum development, instruction, and evaluation; piloting and incorporating appropriate educational innovations into the educational program; and conducting periodic review of curricular content and allocation of time to specific subject areas.
- The dean for academic affairs also chairs the Curriculum Operating Committee, and membership includes the course directors, educational support staff, and one student from each class.

- Broad departmental input into the governance of the curriculum occurs via the Curriculum Advisory Committee. The Curriculum Advisory Committee advises both the policy and operations committees on any issues related to the curriculum, instruction, and student evaluation. Members also participate in the identification of educational and curricular problems.
- Members of the Curriculum Operating Committee elect a course director to chair the committee. Committee membership includes a representative from each department in the school, two students elected from each class, and two alumni of the school appointed by the associate dean for student affairs.
- Implementation of the curriculum rests with the course directors.
- The dean for academic affairs and education appoints course directors, pending approval of their respective department chairs. If the course is subdivided into sections, the course director is responsible for appointing faculty to serve as section leaders.
- Course directors, together with their section leaders, are responsible for all aspects of the course, which include: determining and organizing the content of the course; developing course goals and objectives; coordinating all aspects of the course; enlisting faculty to teach in the course; assuring the quality of the course; developing an instrument for evaluation of the course and the quality of faculty teaching; and specifying the academic standards that students must meet, and thus assigning each student a final course grade.

Office of Education

- The school does not have an office of education. The dean for academic affairs and education and related support staff administer all aspects of the educational program.
- During the planning phases for the new curriculum, the Office of Faculty Development was established. This office has the responsibility of assisting faculty in their roles as teachers. For example, programs are provided to help faculty assume new teaching roles (e.g., community-based preceptors and PBL facilitators) and improve the overall quality of their teaching. The office is also responsible for ongoing course and curriculum review and evaluation.

Budget to Support Educational Programs

- There is a discrete budget for many, but not all, aspects of the educational program.
- This budget is developed annually by the dean for academic affairs and education in consultation with course directors, administrators, and key faculty involved in curriculum governance and operations.
- The budget includes monies for central administrative support staff, some faculty salary support (e.g., course directors), and supplies (e.g., syllabus production).
- The budget is funded with dollars provided to the school by the state.

Valuing Teaching

- Faculty who serve as course directors or who play major roles in the management and delivery of the educational program are recognized by the dean's office through the provision of funds to support a portion of their salaries.
- A formal program to measure excellence in teaching is being developed and piloted.
- Specific recognition of faculty for excellence in teaching, with the exception of student-conferred teaching awards, does not exist at the present time.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In 1990 the dean established the Curriculum Review and Revision Committee. This ad-hoc committee was responsible for coordinating the school's efforts in curricular reform.
- One of the first steps this committee took was to develop goals and objectives for a new curriculum, and to establish career competencies (i.e., learning outcomes) for our graduates.
- In January 1993, the School of Medicine Council approved the goals and objectives, as well as the career competencies. These then served as the guiding principles for development of the new curriculum blueprint.
- The foundations for acquiring career competencies must be established in the undergraduate curriculum. Following additional postgraduate training, graduates should be able to provide high-quality cost-effective clinical care, which includes:
  - Defining, analyzing and solving clinical problems by
    - —considering the wide range of normal and abnormal attributes among individual patients and differ-

  ences in how individual patients respond to treatment;
  - —recognizing the extent and limits of their knowledge bases and clinical skills; and
  - —continually updating and improving their knowledge bases and clinical skills.
- Integrating the biomedical and psychosocial aspects of medical care by
  - —establishing effective patient–physician relationships sensitive to the rights and needs of the patient;
  - —recognizing the impact of the physical, psychological, and social environment on health;
  - —interacting effectively with other health-care providers and all facets of the health-care system; and
  - —promoting health and practicing preventive medicine.
- Critically appraising the efficacy of new diagnostic and treatment modalities and applying them appropriately to one's practice, including
  - —utilizing cost–benefit assessments to compare different modalities; and
  - —developing strategies for utilizing new modalities in an environment of limited health resources.
- Acquiring new information and critically appraising its validity and applicability to one's professional decisions, including the application of information-systems technologies to facilitate the acquisition, storage, and retrieval of information.
- Clarifying and contributing to the resolution of the legal and ethical issues inherent in health care.

Changes in Pedagogy

Table 1 summarizes the changes made with implementation of the new curriculum. The old curriculum represents the curriculum as it existed during the 1994–95 academic year. Implementation of new curriculum began with the 1995–96 academic year, and full implementation was completed in the 1997–98 academic year. The class of 1999 was the first class to experience all aspects of the new curriculum.

- ◆ Small-group activities were increased in the new curriculum through the addition of problem-based learning in years one and two.
- ◆ There has been an increase in the numbers of case-based conferences added to the didactic portion of the curriculum. Of the hours listed as didactic in Table 1, approximately 60% are lecture, while the remainder are small-group conference and laboratory sessions.
- ◆ The school has used standardized patients for over ten years for purposes of instruction and assessment. With implementation of the new curriculum, their use has been greatly expanded.
- ◆ Currently, students interact with standardized patients in each year of the curriculum.
- ◆ Formal evaluation occurs at the end of each year, and students must pass a 14-patient fourth-year assessment as a graduation requirement.

TABLE 1. Old vs. New Curriculum

	Old Curriculum	New Curriculum
Basic medical sciences (years 1 and 2)		
Number of courses	21	5
Total class time	1,820 hours	1,520 hours
Didactic	1,820 hours	1,292 hours
Problem-based learning	0 hours	228 hours
Elective hours (years 1 and 2)	0 hours	80 hours
Clinical courses (years 1 and 2), total hours	238 hours	608 hours
Clinical sciences (required weeks)		
Required experiences	56 weeks	60 weeks
Elective experiences	28 weeks	16 weeks
Inpatient experiences	34 weeks	28 weeks
Ambulatory experiences*	22 weeks	32 weeks
Core clinical disciplines (required weeks)		
Family medicine	None	6–10 weeks†
Internal medicine	12 weeks	10–14 weeks†
Obstetrics–gynecology	8 weeks	6 weeks
Pediatrics	8 weeks	8–12 weeks†
Psychiatry	8 weeks	5.5 weeks
Surgery	12 weeks	9–13 weeks†
Critical care	None	4 weeks
Emergency medicine	None	4 weeks
Continuity practice	None	10 weeks

*Includes student continuity practice in years 1–3.

†Variable length reflects student choice of subinternship in year 4.

Application of Computer Technology

- ◆ The school is in transition with regard to the use of computer technology in its educational programs. The infrastructure to support an "electronic syllabus" is being developed.
- ◆ At present, only some of the educational materials used

in the curriculum are available on the school's information-technology network.
- Once the network is fully developed, students will be required to own laptop computers. No such requirement currently exists.

Changes in Assessment

- Standardized patients are used extensively in the curriculum for both instruction and evaluation.
- Computers are not currently used for assessment.
- Many of the clinical rotations require direct faculty observation of students performing patient histories and physical examinations.
- Standardized patients fulfill many of the functions of the OSCE. Consequently, exams of this nature are not currently used.

Clinical Experiences

The core clinical experiences in the new curriculum include the following:

- Student continuity practice. Students are assigned to a single ambulatory site, where they spend half a day per week through the first three years of medical school.
  - Preceptors for this experience are community-based and include family practitioners, general internists, and pediatricians.
  - The fundamental goals of the student continuity practice are to expose students to patients in a continuity setting from the beginning of their training, and to allow them to become increasingly involved with patient care as their knowledge and skills develop.
  - Typically, students interact with 200–300 patients prior to the start of their third-year clinical rotations.
- Multidisciplinary ambulatory experience. The multidisciplinary ambulatory experience occurs in the third year, is 32 weeks in duration, and contains rotations in family medicine, internal medicine, pediatrics, and obstetrics–gynecology that are each six weeks in duration. A three-week general surgery rotation is also required, as are one-week rotations in ENT and orthopedic surgery. A 14-week (half-day/week) psychiatry rotation completes the multidisciplinary ambulatory experience. Community-based practitioners are involved in many of the rotations that comprise this experience.
- The inpatient experience occurs in the third year, is 16 weeks in duration, and has rotations in internal medicine, surgery, and psychiatry, each of which is four weeks in duration.
  - A two-week rotation in pediatrics is also required.
  - A unique component in the inpatient course is "Beginning-to-End." In this two-week rotation, students follow patients from admission in the Emergency Department through discharge, regardless of the service to which the patient is admitted. The focus of this experience is on the entire spectrum of activity involved from the decision to admit a patient to the challenges of discharge planning.
  - As part of the Beginning-to-End rotation, students learn to distinguish, from within a large unscreened group of presenting complaints, those that require admission in a contemporary cost-conscious setting; observe the process of ongoing review and the relationship between the hospital, the care team, and the payer in determining how the care plan will proceed; gain additional experience in fundamental clinical skills, including the generation of a differential diagnosis and therapeutic and patient education plans; learn the importance of a multidisciplinary approach to care delivery; are exposed to the challenges of proper discharge planning and provision of home care; and observe the importance of the hand-off from inpatient to outpatient follow-up.
  - Every student spends one day at a chronic care/rehabilitation facility.
- The advanced clinical experience occurs in the fourth year, and provides students with an intensive inpatient experience and exposure to issues related to critical and emergency/urgent care. It is divided into three sections: Advanced Inpatient, Emergency Care, and Critical Care. Each section is one month in duration. In the Advanced Inpatient section, students choose a subinternship rotation in family medicine, surgery, internal medicine, or pediatrics. During the Emergency Care rotation, students participate in patient care as it is delivered in an emergency setting. A rotation in a medical intensive care unit, surgical intensive care unit, medical/surgical intensive care unit, or pediatric/neonatal intensive care unit completes this course.

Table 1 summarizes the amounts of time students spend in ambulatory versus inpatient settings.

Curriculum Review Process

- The school began its curriculum review and revision efforts in October 1990. Critical events in the process are summarized below.

  - October 1990: Formation of the Curriculum Review and Revision Committee
  - January 1993: Approval of goals and objectives and career competencies
  - December 1993: Approval of new curriculum blueprint
  - October 1994: Implementation plan finalized
  - August 1995: Begin implementation
  - August 1997: Complete implementation
  - May 1999: Graduation of first student cohort of the new curriculum
- The driving principle of the curriculum revision effort was to provide our students with the knowledge, skills, and attitudes needed for the practice of medicine in the next century. The specific goals for the new curriculum included:
  - Students should develop a fund of knowledge and acquire skills that will enable them to pursue successfully the types of postgraduate training necessary for their chosen careers.
  - There should be appropriate integration of basic science and clinical science, which should take place across all four years. This process should foster the appreciation of scientific investigation, and its impact on the growth of medical knowledge.
  - The educational process should place emphasis on student motivated/initiated learning, and the development of skills for effective problem solving and lifelong learning.
  - In general, the curriculum should emphasize important core concepts, supported by details as appropriate.
  - The location and organization of clinical training experiences should be chosen to reflect the full spectrum of clinical care.
  - The curriculum should be reinforced by a student-evaluation system that is consistent with the goals of the educational program.
- The curricular reform process was led by the Curriculum Review and Revision Committee. This committee was chaired by the dean for academic affairs and education, and had as its members three basic scientists, three clinicians, and a member of the volunteer faculty. As necessary, the committee invited other faculty and students to participate in their work.
  - The committee's first task was to review the entire content of the existing curriculum. In addition, faculty and student opinions about the curriculum, and how it might be changed, were obtained.
  - Coincident with the formation of the Curriculum Review and Revision Committee, several process rules were also established and agreed upon by the School of Medicine Council.
  - First, the curriculum was to be reviewed and revised in its entirety; the curriculum was to be rebuilt from the ground up and not necessarily on any part of its old foundation.
  - Second, the Curriculum Review and Revision Committee would serve as the initiator of ideas and issues, and develop models for consideration by the faculty. While the committee was the driving force for the curriculum revision, ultimately the School of Medicine Council would have to approve the revision plan.
  - Third, the revision process, while iterative, would be progressive.
  - It was further agreed that the School of Medicine Council would formally approve the goals and objectives of the new curriculum, as well as the overall curriculum blueprint.
  - Once the curriculum blueprint was approved, implementation committees were formed for all of the courses in the new curriculum. These committees were asked to define the goals and objectives of the courses, their content, the allocation of hours, the instructional formats to be used, and the resources needed for implementation.
  - Once the implementation plans were finalized, the dean reviewed them and then allocated resources for implementation.
- Several elements were critical to the success of the curricular reform effort. These included
  - Strong leadership by the dean. The curriculum planning and implementation process spanned the tenure of three deans, one of whom also served in an interim capacity during this time. Nevertheless, each provided strong leadership and direction for the curricular reform process.
  - Defined planning and implementation process. Before the curricular revision process was initiated, the faculty, dean's office personnel, and the existing committees charged with curricular responsibility and oversight agreed to the planning and implementation process (see above). Most importantly, they agreed upon what the critical decision points were, and who would have the authority to make these decisions.
  - Communication. Considerable effort was made to keep all faculty informed about the curriculum planning process. To accomplish this task, members of the planning committees made frequent presentations to various faculty groups. The dean for academic affairs and education also made regular presentations to the department chairs and to faculty at the school's affiliated institutions.
  - A newsletter was developed as a vehicle for widespread dissemination of information about the curric-

ular revision. The end result of these efforts was that all decisions were made from an informed perspective, and had the benefit of widespread input and debate.

- History of the school. The University of Connecticut School of Medicine is a young school, having admitted its first class in 1968. As a result, it was not encumbered by history or tradition.
- When the first curriculum was developed, the school adopted the organ-system model for basic medical science instruction. This interdisciplinary approach to teaching was widely accepted by the faculty, and facilitated the acceptance of the new curriculum blueprint that extended interdisciplinary experiences into the clinical portions of the curriculum.
- Absence of external funding. Although the school did apply for external funding for its curricular revision efforts, it was unsuccessful in obtaining any grant or award. In retrospect, this lack of funding, although disappointing at the time, had two powerful and positive effects. First, the faculty understood that the revision was not being driven by the need to meet goals and objectives of a grant, but was fully under their control and direction. Second, and perhaps more important, it caused the leadership of the school to allocate funds from existing resources. This served to reinforce to the faculty that curricular reform was a priority, with durable funding provided to sustain the new curriculum.
- The dean's office provided considerable resources during the planning and implementation phases. These are summarized in Table 2.
  - —Faculty development office. The functions of this office are directed primarily at helping faculty assume new teaching roles related to the curriculum (e.g., facilitating and case development for problem-based learning), helping faculty to improve their teaching skills, and training community physicians (student continuity practice and multidisciplinary ambulatory experience preceptors) so that they become better teachers for our students.
  - —Preceptor stipends. Community-based physicians who are not covered under existing institutional affiliation agreements (approximately 250) are paid a nominal stipend for precepting our students. These are physicians primarily involved in the student continuity practice and multidisciplinary ambulatory experience components of the curriculum.
  - —Clinical skills assessment. With the new curriculum, the program was expanded, and is now used across all years. The incremental cost for expanding the program was approximately $250,000. Also, included in this figure are funds of approximately $100,000 used to renovate and upgrade new space for the program.
  - —Transitional salary support. During the first and second years of implementation, it was necessary to teach some portions of the curriculum twice, essentially to accommodate students still in the old curriculum. In recognition of this effort, and the time such effort diverted from other activities (i.e., research and patient care), the dean's office provided temporary support to a number of faculty. These funds were used in various ways to enhance the academic activities of the faculty.
  - —Teaching space renovation. The new curriculum imposed new demands on the teaching space. In particular, there was a need to develop appropriate small-conference-room space, upgrade the gross anatomy space, and bring the latest in information technology into the classrooms.
  - —Miscellaneous. These discretionary funds were under the control of the dean for academic affairs and education, and were used for unexpected needs not anticipated in the planning process.

TABLE 2. Resources Needed for Various Aspects of Curriculum Revision and Implementation*

Faculty development office	1,358,003
Preceptor stipends	388,833
Clinical skills assessment	350,000
Transitional salary support	595,000
Teaching space renovation	2,648,816
Miscellaneous	150,000
TOTAL	5,490,652

*Costs include personnel salaries, costs of supplies and equipment, and programmatic costs.

◆ Challenges and unanticipated outcomes of the process.

- The principal challenge for implementation of the new curriculum was related to the identification and development of appropriate ambulatory sites for student clinical activity. The student continuity practice alone requires over 200 community-based receptors. By comparison, reducing didactic hours in the first two years and the introduction of problem-based learning were considerably less problematic.
- The implementation of the new curriculum has affected the institution in several ways. Most importantly, student performances on several measures have markedly improved (USMLE Step 1, USMLE Step 2, fourth-year clinical-skills assessment, and residency match). Faculty expectations for student performances in the core clinical rotations in years three and four have also increased. This was prompted by faculty ob-

servations that students beginning their third-year clinical rotations were already performing at a level typically seen only during the latter half of the year in the old curriculum. This increased performance was attributed to the student continuity practice in years one and two. The interdisciplinary and interdepartmental nature of the curriculum has fostered among the faculty a new cooperative spirit focused on our educational mission. Faculty have come together to share new and exciting ideas on topics to teach, and how certain topics may be better taught. Indeed, the whole process of curricular revision has created an atmosphere where experimentation and innovation are encouraged. Additionally, the absence of rigidly defined departmental courses and clerkships has greatly facilitated the introduction of cross-disciplinary themes. Finally, the school has been recognized by the Board of Trustees of the University, members of state legislature, and even by some members of Connecticut's congressional delegation as being proactive in improving its educational programs and attempting to better train our graduates for the health care environment in which they will eventually work.

- Plans for evaluation of the change. The school will continue to monitor student performances on licensing examinations, success in the residency match program, and performances on in-house evaluation tools. The immediate plans for the future are to assess the impact of the new curriculum on the performances of our graduates in their postgraduate training programs, and eventually their practices. To this end, a survey instrument has been sent to all graduates (old and new curriculum), as well as their residency program directors. The questions on the survey are targeted to the career competencies articulated by the faculty and embodied in the educational experiences within the curriculum.
- The school has established a Course and Curriculum Evaluation Committee to continuously monitor and review individual courses and the curriculum as a whole. The committee has the responsibility for conducting regular reviews of the courses in the curriculum and assessing overall effectiveness of the educational program. Based on its reviews and assessments, the committee makes recommendations to appropriate curriculum-governance committees for improvement in the educational program (e.g., content, time allocation, methods for assessing student performance).

Future Goals

- The major issue facing the school at this time is the impact of managed care and the Balanced Budget Act on clinical revenues to the school. As in many other schools, clinical revenues have cross-subsidized our educational programs for many years. As the funds for this type of support are constrained, the educational program at all levels is seriously threatened.
- Beyond this real and immediate threat, the school will need to address the expanded use of information technology in the curriculum, the impact of genetics and molecular medicine on curriculum design and content, and improved education of students regarding health-care issues related to the aging of the population.

The George Washington University School of Medicine and Health Sciences

W. SCOTT SCHROTH, MD, MPH

Curriculum Management and Governance Structure

- There is an assistant dean for student affairs and education who oversees administration of the year one and year two curriculum and manages student affairs for those classes.
- There is an assistant dean for student affairs who oversees administration of the third- and fourth-year curriculum and manages student affairs for those classes.
- There is an assistant dean for educational policies who oversees student advancement and academic and professional comportment issues, and provides confidential student counseling for mental health and personal issues.
- There are assistant deans for special curricular projects, who oversee the interdisciplinary Practice of Medicine (POM) curriculum across four years and the innovative courses and student evaluation technology.
- The curriculum is managed by the Committee for Undergraduate Medical Curriculum (CUMC), which oversees the entire curriculum and approves curricular changes.
- The committee is chaired by a member of the full-time faculty and has faculty, student, and decanal representation.
- A curriculum subcommittee reviews curricular performance and proposals and reports to the CUMC.
- This subcommittee is chaired by a member of the full-time faculty and has faculty, student, and decanal representation.
- A subcommittee for evaluation reviews course evaluations.
- This subcommittee is chaired by the director of the Office of Education with faculty, student, and decanal representation. The committee reports to the CUMC, working groups, and the curriculum subcommittee.
- There are three working groups (all of which report to the curriculum subcommittee):
  - Year one group: coordinates the year one curriculum, and is chaired by a member of the full-time faculty. The group has faculty, student, and decanal representation.
  - Year two group: coordinates the year two curriculum and is chaired by a member of the full-time faculty. The group has faculty, student, and decanal representation.
  - Years three and four group: coordinates the clinical curriculum and is chaired by a member of the full-time faculty. The group has faculty, student, and decanal representation.

Office of Education

- The Office of Medical Education was formed in 1996.
- The office has a part-time faculty director and three administrative support staff. The functions of the office are relatively circumscribed. It does not yet have the resources for wider support of the entire curriculum, advanced research in educational effectiveness, or complex enhancements of evaluation procedures.
- The current functions include:
  - Oversight of course evaluation procedures
  - Administrative support for interdisciplinary courses: Introduction to Clinical Medicine in Year II (the core, integrated, organ-based course of year two) and Practice of Medicine (the longitudinal four-year course including the Doctor, Patient and Society course, a problem-based learning curriculum, the Primary Care Apprenticeship Program, and advanced topics in basic science–clinical science integration, medical decision making, ethics, and critical appraisal)
  - Consultation regarding curriculum proposals/enhancements
  - Liaison with the library faculty who coordinate the medical informatics curriculum
  - Oversight and development of performance-based examinations

Budget to Support Educational Program

- There is a central education budget of approximately $1 million controlled directly by the dean for academic affairs. This budget predominantly supports faculty with key administrative roles in the education program (course directors, clerkship directors, etc.).

- An instruction budget includes all other tuition support to basic science and clinical departments. The instruction budget is utilized at the discretion of the department chair to provide staff support for medical student educational programs and additional faculty support for teaching.
- A dean's office budget supports all other administrative functions of the medical school, including admission, financial aid, faculty affairs, and the Office of Education.

Valuing Teaching

- Excellent educators are recognized by either the student body or the medical school.
- Annually, the students elect a member of the preclinical faculty and a member of the clinical faculty for the American Medical Student Association's Golden Apple Award.
- The medical school's Society of Distinguished Teachers may elect up to two members each year based on sustained excellence in student teaching. Election carries a cash award and permanent membership in the society.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school adopted a set of goals and objectives for the MD curriculum in 1996. This document outlines the competencies expected in several areas, including skills, knowledge, attitudes, and ethical and professional behavior.
- A specific set of goals and objectives for the clinical curriculum has recently been completed by the Years 3–4 working group of the curriculum subcommittee. (A list of these objectives is available from the author.)

Changes in Pedagogy

- 1973—The core Introduction to Clinical Medicine course of year two began to utilize small-group, case-based discussion formats.
- 1991—The Optional Primary Care Apprenticeship began. This is an office-based experience one-half day every other week for the first two years. It became a mandatory component of the POM curriculum in 1993.
- 1993—Conversion of traditional patient interviewing and physical diagnosis curriculum into the small-group Doctor, Patient, and Society course, integrating doctor–patient communication training, physical exam skills, cultural competency, etc. (60 hours per semester).
- 1994—Adoption of performance-based end-of-semester examinations for first- and second-year students. Examinations utilize videotaped interactions with standardized patients.
- 1995—Adoption of a parallel, longitudinal problem-based learning curriculum (80 hours of instruction time each semester) during the first two years. Cases integrate basic science objectives with objectives from the domains of medical decision making and contextual issues (growth and development, cultural influences, ethics, biopsychosocial aspects of medical care, spirituality, etc.).
- 1996—Development of the Clinician as Medical Educator course, in which fourth-year students are instructed in teaching and evaluation skills and trained as standardized patients for the teaching and evaluation of clinical skills among students in years one, two, and three classes.
- Recently, the Web-based Prometheus platform (described in the next section) has become available for course organization and student–faculty communication.

Application of Computer Technology

- Students are not required to have computers.
- The medical school library has a large computer center for student use and Web-based remote access for students who are off campus or on clinical electives at sites not linked to the medical center's network.
- The library maintains an extensive array of resources available locally or by remote access:
  - Internet access and search capabilities
  - Computer-assisted instructional modules in anatomy, pathology, and other subject areas
  - On-line texts and reference materials
  - Literature search engines
  - Links to a variety of Internet resources for medicine, patient education, statistics, etc.
  - Bibliographic materials in a variety of subject areas
  - Administrative access to various school offices and functions
  - Global school and medical center calendars
  - Electronic mail
  - Electronic journals
- The main university supports a unique instructional resource known as Prometheus. Prometheus serves as a unified Web-based platform for course syllabi, on-line ref-

erences, class notes, lecture schedules, bulletin boards, chat rooms, and faculty-to-student or student-to-faculty communication.

- The microbiology course and the year three POM course have recently migrated to Prometheus, and it is anticipated that most other preclinical and some clinical courses will utilize this platform over the next two years.
- All GW medical students must satisfy basic computer literacy requirements and pass a series of more advanced informatics instruction modules linked to other course work across the first two years.
- All student course evaluations are now completed on a Web-based platform.

Changes in Assessment

- Use of standardized patients in performance-based examinations at the end of each semester of years one and two
- Adoption of a new universal clinical clerkship student evaluation form

Clinical Experiences

- There is a primary care apprenticeship where all students spend half a day every other week in the offices of full-time or clinical faculty members practicing in the specialties of general internal medicine, general pediatrics, or family medicine. A student is paired with the same preceptor for two years, and approximately 50% return to their preceptors for six weeks during their primary care clerkship in year three.
- Year three contains six core clerkships:
  - Surgery: two months; one month focused on general surgery, the second month focused on two two-week surgery specialties (urology, otolaryngology, orthopedics, plastics, cardiothoracic, neurosurgery)
  - Medicine: two months of inpatient care
  - Primary care: six weeks of ambulatory care experience in family medicine, pediatrics, internal medicine, geriatrics, hospice care, or community medicine (each student has two primary sites of practice)
  - Psychiatry: two months, all inpatient care
  - Obstetrics–gynecology: two months of mixed obstetrics and gynecology, ambulatory care, and inpatient care
  - Pediatrics: two months, one ambulatory
- Year four—students take 16 weeks of required course work (emergency medicine, neuroscience, anesthesia, surgery specialties, didactic courses, and an acting internship in pediatrics, internal medicine, or family medicine). Students have 18 weeks of required elective course work in any specialty area.

Curriculum Review Process

- The curriculum management structure described above reviews the educational programs in an ongoing fashion. The following are key challenges facing the school in the next five years:
  - Maintaining faculty commitment to more intensive small-group teaching methods
  - Continuing the adoption of advanced informatics capabilities in the curriculum
  - Sustaining adequate patient volume for student education in acute care settings
  - Expanding educational opportunities in ambulatory settings and in the community
  - Advancing student assessment technology by adopting more sophisticated evaluation methods
  - Sustaining and advancing a commitment to the highest standards of professionalism
  - Achieving these goals in an environment of intense and progressive resource constraints

Georgetown University School of Medicine

F. DANIEL DAVIS, PHD, LOUIS B. JACQUES, MD, S. RAY MITCHELL, MD,
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Curriculum Management and Governance Structure

- In 1989, Georgetown revised its governance structure. Reporting to an executive vice president and executive dean are four deans: the dean of the school of nursing, the dean for clinical affairs, the dean for research and graduate biomedical education, and the dean for academic affairs.
- The dean for clinical affairs has had responsibility for the clinical enterprise, including the hospital, faculty practice plan, and faculty practice network; he or she also has had responsibility for graduate medical education.
- The dean for research also has held an appointment in the graduate school and is responsible for graduate biomedical education.
- The dean for academic affairs has had responsibility for the school of medicine's programs for undergraduate and continuing medical education.
- This structure was designed to strengthen the authority of the executive vice president for health sciences, who has had oversight over all medical-center-related efforts. It also placed additional emphasis on the importance of the clinical enterprise and graduate medical education, and underscored the focus on research. During the past decade, the research enterprise has grown considerably, with Georgetown now ranking as number 45 in receiving NIH support. The school receives over $100 million in sponsored research support annually.
- The restructuring process has also strengthened accountability for graduate biomedical education, medical student education, and nursing undergraduate and graduate education.
- All of the administrators, including the deans, are expected to devote a portion of time to their clinical and/or research activities as well as direct education activities.
- The current administrative governance structure in the school of medicine includes four associate deans and two assistant deans reporting to the dean for academic affairs.
- Of the four associate deans, one is full time and directs educational planning and evaluation and the Office of Continuing Medical/Professional Education.
- The associate dean for the clinical curriculum is 75% time, devoting 50% of the time to the education program, and the remaining 25% to student affairs and support.
- The associate dean for the preclinical curriculum spends half of his or her time in the education program.
- The associate dean for admissions spends about one fourth of his or her time in the admission function, working with a full-time director of the Office of Admissions.
- There is an assistant dean for students and special programs who also directs minority-related activities, and an assistant dean for international activities.
- Administrative educators also reporting to the academic dean are the director of the library and learning resource center, the director of educational media, and the director of student financial services.
- Educational policy is set by the executive faculty (composed of department chairs, institute directors, representatives from the faculty senate, deans, and associate deans), who approve policies recommended by faculty committees such as the Committee on Medical Education.
- Recent economic constraints on the academic health center, as well as in the local market, have led to further structural evolution. In February 2000, Georgetown signed an agreement with a not-for-profit partner, MedStar Health. Under the terms of this agreement, which was effective July 1, 2000, MedStar, not Georgetown University, will have responsibility for the clinical enterprise, including Georgetown University Hospital, the Faculty Practice Group, and the Community Practice Network.
- Clinical faculty will continue to hold university appointments, but they will be MedStar employees.
- There will be no change in the academic missions of research and education, and these areas will remain part of the university.
- Department chairs will be responsible to MedStar for the clinical functioning of their departments, and responsible to the deans of research and academic affairs for their research and educational functions.
- For the initial transitional period, the executive vice president will continue to have authority over all facets of the enterprise.
- It is anticipated that the positions of dean for academic affairs and executive vice president will be combined in the future, and there are plans to initiate a national

search for someone to fill this position within the near future.

- Since early 1999, there has been an extensive planning process involving more than four dozen faculty who have served on an academic planning committee or its subcommittees (on basic science education, clinical science education, graduate biomedical education, and research) and who have assisted in defining the structure of the new academic relationship.
- The committee was co-chaired by the dean for academic affairs at the school of medicine and the dean of the graduate school, and had representation from all campuses. The committee assisted in developing an academic affiliation agreement for the new relationship.
- The design of this partnership is unique, but offers a strong balance of clinical strength, financial stability, and focus on the academic mission.

Office of Education

- The office was established coincident with curriculum revision and re-evaluation in the early 1990s.
- The office is housed within the office of the associate deans of the school of medicine, and was initially staffed by a PhD educator and a staff of associates. It focused on the development of faculty skills, small-group teaching, curricular management, and evaluation.
- Current efforts have expanded to include course and student evaluation, informatics, and problem-solving activities.
- The associate dean for educational planning has assumed leadership responsibility, and an effort is under way to expand the professional staff, especially in the area of evaluation.
- The office interfaces with other educational support activities within the office of the academic dean, including the medical library, the biomedical academic computing center, and the Office of Educational Media. These activities are currently funded through the tuition-based budget.
- A goal of the current development campaign is to create a center for excellence in medical education, which includes an endowed chair for medical education (funded within the past year), a faculty development center for media and electronic methods, and professorships in medical education. The center would provide key teachers with partial support over two to three years to work with the center and the office of the academic dean in developing educational programs.

Budget to Support Educational Programs

- The current budget for the school of medicine is funded through tuition-derived dollars. Since the costs of medical education exceed tuition, over the past decade the school has utilized funds from the clinical enterprise to subsidize both medical education and research.
- As the funding from the clinical enterprise has diminished, and as the process of the clinical partnership with MedStar Health evolved, the school has begun a process of valuation of its mission-based efforts, designed to analyze the structure of academic and research efforts, as well identify the difference between actual costs of these efforts and available tuition and grant funds.
- The mission-based valuation of the education process is becoming the template for a move toward rational budgeting process.
- As a part of the Third Century Campaign of the university (a development effort), the school is working to increase its resources and close the financial gap through grants and philanthropy.
- The clinical partnership is a gain-sharing opportunity with resources to strengthen the academic mission.

Valuing Teaching

- The departments identify primary teaching faculty; department chairs work in concert with the academic dean to identify those responsible for educational efforts (e.g., a course or clerkship director).
- The faculty constitute the core membership of educational planning committees.
- The rank and tenure process traditionally is the mechanism to recognize teaching efforts by faculty. However, students honor faculty who have made significant contributions to their education through the yearly Golden Apple faculty teaching awards (one for each class year) and the Kaiser Permanente Awards for sustained excellence in teaching (one for clinical science and one for basic science each year).
- Students also award faculty for excellence in teaching anatomy, for gender equity, and for humanism. Students vote for these faculty through secret ballots, and both nominees and awardees are recognized at a formal school-wide banquet and at graduation ceremonies.
- Students evaluate each course and clerkship, and provide additional feedback through the AAMC graduation surveys and postgraduation surveys on the perceived quality of their education. Through their responses, it is apparent that students perceive that the faculty are committed to teaching.

- The promotion and tenure committee has increasingly valued teaching (in addition to other scholarly activity) in determining promotion and tenure of full time faculty.
- While educators have always been eligible for promotion and tenure based on nationally recognized scholarly recognition in education, in 1993 the school also began a clinician educator track. This non-tenure track recognizes individuals who dedicate significant and sustained efforts to scholarship in education: developing educational materials, administering educational programs, and demonstrating excellence in teaching.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Faculty have begun the process of clarifying expectations for graduates through several venues.
- Education committees have been reviewing the education guidelines developed by the AAMC's Medical School Objectives Project (MSOP) and their applications to the school's curriculum.
- Both basic and clinical science faculty utilize the USMLE content area as a source in defining course and clerkship knowledge objectives.
- Clinical clerkship directors have drafted a core knowledge list for primary care and are developing a list of expected learning outcomes and clinical skills for each clerkship. They also are developing a brief introduction to clinical skills immediately prior to the third year, as well as a plan for specific clinical skills assessment.
- Students, through the student medical education committee (which provides ongoing input to the various faculty education committees upon which students serve and vote) and a student-developed Task Force on Professionalism, have drafted a statement of professionalism and expected behavior (of faculty as well as students), using a broadly representative process of soliciting input from students, faculty, and school leaders. This effort will lead to specific recommendations for course content and outcomes related to such topics as cultural diversity and professional behavior.

Changes in Pedagogy

- The overall curriculum can be described as a hybrid of traditional department-produced, lecture-based instruction combined with problem-based learning, clinical problem solving, small-group teaching, and early clinical exposure.
- With the addition of PBL in the mid-1990s, course directors were asked to reduce lecture hours.
- In addition to the traditional basic science courses, the first and second years contain clinical bridging courses such as clinical bioethics and religious traditions in health care, as well as a practicum in ambulatory care.
- In the first year, small-group and case-based discussions are held in Introduction to the Patient, Introduction to Health Care, and clinical bioethics, which include interviews of actual patients.
- In the second year, clinical bioethics, psychiatry, dermatology, physical diagnosis, and problem solving also use case-based, small-group teaching, and a second semester about ambulatory care provides a practicum for developing clinical skills.
- Small-group discussions use PBL in the first year, in some courses.
- Case-based, patient-oriented problem solving occurs in pharmacology, pathology, and microbiology and immunology.
- The past two years have seen a de-facto decrease in small-group teaching, a change that is related to financial pressures on faculty time and effort.
- Standardized patients are used for teaching and/or assessment in the first year (Introduction to the Patient), the second year (physical diagnosis), and the fourth year (emergency medicine).
- In 1999–2000, the school initiated a required week-long course in clinical pharmacology and pharmacotherapeutics that was case-based and used both lectures and small groups.

Application of Computer Technology

- Students are not required to purchase computers, but recent estimates indicate that at least 70% of the students are connected to the Internet at home.
- Computers with on-line capacity are available in the major classrooms, and plans are to upgrade additional educational venues so that computers can be utilized in both large-group and small-group teaching.
- All students have e-mail accounts through the school, and computer facilities are provided in the library's biomedical academic computing center.
- On an ad-hoc basis, courses have integrated computer technology to varying degrees.
- In the third-year family medicine clerkship, which lasts

four weeks, students on rural tracks are provided with laptop computers and Internet accounts. They participate in small-group case discussions over the Internet, and have resources for medical information retrieval through links to the medical library.

- Third-year students also maintain computer-based logs of patients and of procedures observed and performed.
- Virtually all functions of student and course registration and management are handled on line.
- Each first-year student is required to complete an introductory informatics course.
- A task force is currently exploring an integrated four-year informatics curriculum.
- The medical library home page serves as a portal for most students to reach these resources.
- The school has added a MEDCAREERS home page with active links to all career-planning resources on line as well as the links needed for the matching process.
- A project has been initiated to develop a personalized home page for faculty that links important resources (Medline, MD Consult, and other licensed electronic journals available through the library) for education and faculty development.
- Classrooms are gradually being upgraded to state-of-the-art media equipment in conjunction with live access to Web-based curricular materials. The principal classrooms for the first and second years have been upgraded, and small classrooms will follow.
- One course has moved to a Web base for course materials —with all lectures being available outside class on the Web; others are following suit.
- The internal medicine clerkship has all objectives, study questions, and clerkship assignments on the departmental Web page; other departments are developing similar materials.
- There is a Web-based case log system that is being upgraded to track individual students' patient and problem exposures across all clerkships, and to relate such exposures to goals of the clerkship.
- The Department of Family Medicine has piloted a Web-based program for students at remote sites where case logs are reviewed, reference resources and learning objectives are provided, and a virtual small-group discussion is conducted once a week.
- At least three vertical integration groups (in geriatrics, clinical pharmacology and error reduction, nutrition, and bioethics) are planning Web-based tracking of educational themes across the curriculum so that students can utilize resources in the area and monitor their progress toward completion of objectives (mastery of materials) over four years.

Changes in Assessment

- Standardized patients are used in the preclinical years, and there are plans to initiate OSCEs with SPs as part of clinical assessment.
- Every third-year student must complete one patient workup (history and physical) under faculty observation.
- One major new thrust of the interdisciplinary curriculum in clinical ethics is reflected in the curriculum's use of skill-based exercises in certain topic areas of clinical ethics, e.g., truth telling and breaking bad news, informed consent and refusal, and genetic counseling.
- In part two of the curriculum, faculty observation of student performance of these skills has been included, along with the usual assessment methods (e.g., observations of small-group interactions and contributions, essays, and objective examinations on content).

Clinical Experiences

- Students go to physicians' offices all four years: in years one and two as part of ambulatory care (one semester each year), and in year three as part of extensive ambulatory care experience in pediatrics, family medicine, and internal medicine.
- Brief experiences in physicians' offices or other ambulatory settings may occur in neurology, psychiatry, obstetrics–gynecology, and/or surgery and the surgery specialties.
- The fourth year contains two four-week required ambulatory care rotations (selected from internal medicine, family medicine, pediatrics, obstetrics–gynecology, and psychiatry), which may take place in physicians' offices or in other ambulatory settings. Students may also elect to have rotations in physicians' offices.
- Second-year students learn physical diagnosis in physicians' offices, other ambulatory settings, and the inpatient units of Georgetown University Hospital and its affiliated hospitals.
- All third-year rotations (and the required 12 weeks of acting internships in the fourth year) have inpatient components at Georgetown University Hospital and/or its affiliated hospitals.
- Fourth-year students also have four weeks' clinical experience in an emergency department setting.

Curriculum Review Process

- The school has recently launched a process of curricular review.

- In the 1998–99 academic year (more than three years ahead of the schedule for the self study in preparation for reaccreditation by the LCME), the school initiated an ongoing process of intensive analysis of each component of the preclinical (both basic sciences and bridging courses) and clinical curricula.
- The reviews are conducted by ad hoc committees composed of faculty (with expertise in or relevant to the subject matter of the clinical component) and students.
- Materials utilized in the review include basic information and curricular materials from the component, such as syllabi, handouts, and methods; the results of student evaluations of the component; and external and internal student performance data (e.g., standardized examinations), along with other "external" information including "model" curricula developed by specialty or academic societies, topic outlines from the USMLE, and reports and recommendations of such organizations as the AAMC, and the AMA.
- To date, all clerkships in the third and fourth years have been reviewed, and approximately one fifth of the preclinical courses have been assessed.
- There have been several major curricular review and reform initiatives addressing specific themes, including ethics and professionalism, medical informatics, clinical problem solving and decision making, gerontology and geriatrics, and fundamental clinical skills.
- The ethics and professionalism initiative resulted in the design of an interdisciplinary, four-part curriculum (which brings together graduate nursing students and medical students), which is now in year two of its implementation, with parts one and two fully developed, tested, and in place. In fall 2000, a pilot of part three will be tested, and in spring 2001, a pilot of part four will be tested.
- The informatics assessment in 1998–99 yielded a comprehensive report recommending the integration of informatics materials throughout the four-year curriculum.
- The problem-solving and decision-making initiative has just yielded a report recommending a move toward more competency-based learning that will run throughout the preclinical and clinical curricula and enable students to better understand and achieve the relevant objectives with a greater awareness of relationships such as those between problem-based learning and clinical decision making.
- The fundamental clinical skills initiative has yielded a new addition to the third-year curriculum that will offer a brief basic introduction to several key skills prior to the beginning of the clerkships.
- A review of the geriatrics curriculum has initiated a process of vertical integration of geriatrics topics and concepts throughout the existing curriculum, with defined goals and skills, utilizing case-based as well as Web-based materials and assessments.

Planning and Implementing Change

- The planning and implementation resources required for these efforts include
  - ideas and examples drawn from the literature and from other institutions engaged in similar efforts
  - accurate, comprehensive data, e.g., on student performance and on evaluation results
  - administrative leadership
  - faculty time
  - student time
  - funding for materials development, equipment, and support
- The challenges of this process include
  - against the backdrop of serious constraints on faculty time, the ability to recruit dedicated faculty to lead and participate in these efforts
  - the ability to overcome "systemic" inertia that often greets appeals for fundamental change (particularly when the system seems to be working well)
  - the question of whether to pursue incremental or more global strategies for curricular change and renewal
- The innovations and changes described above will be formally assessed by students via the many systems for curricular evaluation and feedback by the faculty involved, and with reference to "outcomes" data and information, including student performances on institutional and standardized examinations.
- Educational reviews take place routinely through the subcommittees on clinical curriculum and preclinical curriculum of the Committee on Medical Education. There is a Web-based evaluation program for students to assess individual courses, their subcomponents, and teaching faculty. The resulting information is continuously shared with course directors responsible for the courses and with their department chairs, course faculty, student education committees, and the deans.
- Students present their assessments of courses to the deans, course and clerkship directors, department chairs, and student education committees in a series of meetings throughout the year.
- Clerkship directors, department chairs, and students join deans in on-site visits to the clinical sites in the teaching hospitals and ambulatory care settings.
- The school reviews responses to the AAMC's matriculation and graduation questionnaires, postgraduation

questionnaires (sent to the graduates at the end of the PGY 1 year), residency directors' responses to questionnaires about the graduates, and data from the USMLE and other sources.

- By the end of the calendar year 2000, the process of institutional self-study leading to accreditation review by the LCME will be initiated. It will build upon and integrate the work accomplished by the component-by-component reviews described above and will also engage the school in an analysis of broader, program-wide issues, including greater definition of the objectives for the program as a whole and for each of its components.
- In addition to assessing the efficacy of the curriculum in preparing students for the self-directed learning of the 21st century, one of the key issues the school will have to address will be the effects and implications of its recently approved clinical partnership with MedStar Health, the region's largest not-for-profit health system.

Howard University College of Medicine

PAULINE Y. TITUS-DILLON, MD

Curriculum Management and Governance Structure

- The dean is the chief administrative officer and chief academic officer of the College of Medicine. Thus, full authority and responsibility for all academic programs and activities of the college reside with this individual.
- In July 1996 the authority, duties, and responsibilities of vice president for health affairs (VPHA) and dean of the college of medicine were merged. The rationale for merging the leadership authority and responsibilities for these two major units into one was to optimize their interrelatedness and to achieve maximal efficiency in decision making.
- This organizational structure is likely to achieve greater effectiveness in interfacing of decisions affecting educational, research, and clinical services.
- The VPHA/dean reports directly to the president of the university and is a member of the president's administrative cabinet. The VPHA/dean sanctions all decisions involving health affairs, including those of Howard University Hospital (HUH), our primary teaching facility.
- In December 1996 the university appointed its first provost and chief academic officer.
- The provost was authorized to assume responsibility and oversight of all academic programs. Approval of all academic programs, including those of the College of Medicine, is sanctioned by the provost before their submission and final approval by the Board of Trustees.
- While there is a dual reporting relationship of the dean of the medical school, the authority and responsibilities of the VPHA/dean ensure a direct link of the chief academic officer of the college to the president of the university.

Office of Education

- An Office of Medical Education (OME) was established in the 1970s.
- During the past decade, the leadership has changed from that of a director to that of an assistant dean of medical education.
- The assistant dean directs all the academic support programs.
- The assistant dean has been instrumental in the reinstatement of grant support for these programs.
- The assistant dean has spearheaded the effort to introduce problem-based learning and has organized elective offerings.
- Under this leadership, computer-assisted instruction and evaluation have been expanded. Review programs for the United States Medical Licensing Examinations have been formalized.
- More faculty development opportunities have been created.

Budget to Support Educational Programs

- The College of Medicine is not an autonomous unit with the university; its finances are intricately tied to those of the university, and are derived from a number of sources.
- The university provides a direct appropriation to the medical school for day-to-day operations.

Valuing Teaching

- Faculty development usually emanates from departments through team-teaching units.
- The OME monitors development of faculty teaching through student feedback forms.
- There is no special designation for faculty whose primary responsibility is teaching.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school has developed objectives for the educational program. A copy of the objectives is available from the author.

Changes in Pedagogy

- There are more small-group discussions.
- There is more computer-assisted instruction.

Application of Computer Technology

- All students are required to own computers.
- The faculty recommends software for use by the students.
- The Learning Resources Center also has computers that students can use.

Curriculum Review Process

- The Curriculum Committee in the College of Medicine has the responsibility for ongoing review of the education program.
- The committee has undertaken the complete revision of the standard four-year curriculum.
- This committee is in the process of designing highly integrated programs for year one and year two. Year one will consist of major foundation courses that will include extensive clinical applications. Year two will be structured on an organ-system format. Years three and four will include incorporation of appropriate basic science principles in the third-year clinical clerkships and the required fourth-year clinical clerkships in medicine and surgery.

Future Goals

- The major issues that the college of medicine is likely to address during the next five years are related to the implementation, operation, and evaluation of a new integrated curriculum, which is slated to start in August 2001.
- Another major issue that the college of medicine will address through the Curriculum Committee is student evaluation.

University of Florida College of Medicine

ROBERT WATSON, MD, AND LARRY ROOKS, MD

Curriculum Management and Governance Structure

- The governance structure in the College of Medicine is one in which the dean delegates responsibility for and authority over the education program.
- In 1990 a new position, senior associate dean for educational affairs (SADEA), was established, and it is to this person that the dean delegates responsibility and authority. This organizational structure has facilitated centralized management of the education mission across the continuum.
- The college uses mission-based management in which the SADEA manages the education mission across departments; the faculty is responsible for planning, implementing and evaluating the curriculum.
- The college's curriculum committee represents the faculty, with authority coming from the dean. An empowered curriculum committee has allowed the program for medical student education to make changes based on education principles.

Office of Education

- The College of Medicine Education Center (COMEC) was established in 1994. This office has consolidated the education resources of the college and is charged with the day-to-day task of implementing the curriculum plan.
- COMEC maintains an extensive database that addresses student performance, course quality, and the overall impact of the curriculum on professional development of students.
- The relationship between the planning of the curriculum by the curriculum committee and its implementation and evaluation by COMEC has allowed the college to more consistently provide support to faculty and departments and feedback to the curriculum committee.

Budget to Support Educational Programs

- The College of Medicine first started developing the concept of mission-based budgeting (MBB) in 1990. Over the past decade the college has refined the concept and developed software to collect data, and it has an extensive database of faculty effort in the education mission.
- The budget is provided through state funds, and alignment of state revenue with faculty education effort is becoming a reality.
- The availability of a defined budget for education allows management of the education mission across departments; this cultural change has probably done more to facilitate curricular change than any other factor.
- The full support of the dean is essential to implement mission-based budgeting and accomplish curricular renewal.

Valuing Teaching

- One of the goals is to identify faculty whose primary commitment is to teaching, and to recognize and reward their contributions to the education mission. This goal became a possibility with the implementation of MBB.
- The essential principles of MBB are to collect data on faculty education effort and its quality and to link faculty productivity with the education budget. Course and clerkship directors report individual faculty education effort directly to COMEC. These data are summarized departmentally and are used to determine the proportion of education dollars allotted to each department.
- The SADEA has determined that participation on key education committees is equivalent to teaching activity and is included in a faculty member's overall education effort report. This has made it easier to recruit and retain high-quality committee members.
- The college provides financial awards and ample publicity for faculty who have won teaching awards and for departments that receive recognition from students for having the best courses or clerkships.
- Year-end bonuses are given to individuals whose performances as teachers or as members on education committees have been exemplary.
- Initiated by a society of Teaching Scholars

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CURRICULUM RENEWAL PROCESS

Learning Outcomes

- ◆ In order to have an effective curriculum plan it is necessary to know what the faculty expects students to learn and be able to measure whether they have learned it.
- ◆ In 1998 the curriculum committee adopted a set of competencies, organized in 11 categories, that describe the set of knowledge, skills, and behaviors that each of our students should master to be eligible for graduation. All courses and clerkships choose from this list in order to determine learning objectives.
- ◆ Competency attainment has become the currency of our curriculum and student evaluation. Grades and achievement of competencies are now used to evaluate students. [See ⟨http://www.med.ufl.edu/oea/cc⟩ for the list of competencies.]

Changes in Pedagogy

- ◆ Use of small-group teaching continues to increase in both basic and clinical science courses. This has been facilitated by the clinical presentation model, which provides direction for case selection and serves as a mechanism to integrate basic and clinical science. Case-based discussions are best done in a small-group format.
- ◆ Standardized patients are used extensively in helping students learn and in evaluating their progress.
- ◆ Standardized patients are used during the first year of medical school not only to help students learn to communicate better but also to help them learn the essentials of the physical examination.
- ◆ Use of standardized patients in the second year to help students learn the physical examination in more detail is progressing.
- ◆ A series of three performance-based evaluations now tracks student competency development and guides needed remediation. This evaluation system operates independent of the course-grading system.
- ◆ Three clerkships use performance-based evaluations during the third year.

Application of Computer Technology

- ◆ Information technology is essential to the future administration of the education mission and to finding more effective and cost-efficient ways for students to learn. For administrative functions, the college has accomplished
  - routine use of e-mail for communication between faculty, staff, and students
  - on-line schedule/calendars
  - on-line faculty, staff, and student directories
  - medical student class Web pages
  - on-line student, faculty, and course evaluations
  - on-line student testing
  - computer-facilitated performance-based testing
- ◆ In order to help students become more knowledgeable about the use of information technology and to assist them in learning, the college has instituted
  - primary and supplemental instructional materials on-line
  - on-line note services
  - electronic library services
  - interactive discussion lists
  - during the first year, students
    - —learn basic Medline
    - —have at least one Medline-based experience each semester
    - —perform a computer-based education exercise in the Keeping Families Healthy course
    - —demonstrate the ability to access information as part of a performance-based evaluation at the end of year one
  - During the second year, students
    - —receive advanced Medline instruction
    - —participate in a use of the Internet seminar during evidence-based medicine (EBM)
    - —participate in a Medline-based exercise in EBM
    - —participate in an intellectual property seminar
    - —use computers in a series of ethics exercises
    - —use computers in physical diagnosis
    - —demonstrate the ability to access and use information technology as part of a performance-based evaluation at the end of year two
  - During the third year, students
    - —routinely use Medline in more than 50% of their clerkships
    - —participate in a patient education exercise
    - —participate in a confidentiality seminar
    - —demonstrate their information technology skills to access data and the literature as part of a performance-based evaluation at the end of the third year
  - During the fourth year, students
    - —may take an advanced information technology elective
    - —are encouraged to do special projects in information technology

Changes in Assessment

- A variety of methods evaluate student progress. The biggest change in assessment of students is continued expansion of the use of performance-based evaluation. We are very fortunate to have the Harrell Professional Development and Assessment Center, which was designed for this purpose. Standardized patients are used extensively in many evaluation settings.
- We are rapidly moving to a computer-based evaluation system for all aspects of the educational program. The ultimate goal is a paperless environment.
- We are looking at models to improve student self-assessment and will continue to expand the use of peer assessment in evaluating student competency.

Clinical Experiences

- Students gain clinical experience starting in the first semester of medical school. Their first patient care experience is a three-week preceptorship at the end of the semester. Every student is assigned one-on-one to a community-based primary care physician during this block.
- There is additional ambulatory training in the interdisciplinary generalist clerkship that is required in the third year. This course also uses community-based physicians' offices as clinical training sites.
- The majority of the clinical training occurs in the clinics and wards of the two major campuses in Gainesville and Jacksonville. These are part of the Shands Health Care System.
- The Veterans Affairs Medical Center across the street from the Shands Teaching Hospital in Gainesville is also a critical asset to the teaching programs.
- Additional clinical sites in selected courses include hospice, nursing homes, rehabilitation centers, and public health departments.

Curriculum Review Process

- After a period of experimentation and innovation that began early in the 1990s, we decided to completely reevaluate our curriculum.
- The curriculum committee first adopted a set of educational principles that would guide curriculum planning.
- Next we adopted a set of goals derived from the principles.
- The clinical presentation model was selected as a strategy for integrating basic and clinical science and to serve as a yardstick for determining course content in the basic sciences.
- The review process culminated in 1996 with the adoption of the Educational Program Renewal Plan (see ⟨http://www.med.ufl.edu/oea/cc⟩ for details). This process has now spanned the tenure of two deans, both of whom have steadfastly supported curricular renewal. With strong support of the deans and the establishment of COMEC, adequate resources have been available.
- The SADEA has served with both deans and succeeded in empowering the curriculum committee to take the lead in continuous curricular renewal. Resistance to change has been present but has not been a significant deterrent, in large part because of the support of the deans and the recognized quality and commitment of the education leadership.
- The most difficult issue in curricular renewal is surfacing in the form of our ability to teach or impart "professionalism" to our students. How do we ensure that our students become truly caring and compassionate physicians? We struggle with this issue in the context of a rapidly evolving health care delivery system that sometimes considers finances over patient care. It is difficult to produce humane physicians in an environment that is not entirely humane.
- As part of the Educational Program Renewal Plan, the curriculum committee adopted a new comprehensive evaluation system. It includes four components: evaluation of students, faculty's education effort, courses and clerkships, and the education program.
- A permanent subcommittee of the curriculum committee was established and is implementing this plan.
- The yardsticks used to evaluate the overall program are our Principles of Educational Design and Implementation. We look at one or more of these principles each year in order to determine whether our program is reflecting our original intent.

University of Miami School of Medicine

MARK T. O'CONNELL, MD

The school is currently involved in a major curricular reform initiative. The project has been under way for the past four years, and with the current timeline, the plan is to implement a dramatically different curriculum beginning in August 2001. In order to acknowledge what has been done during the 1990s and what is planned in 15 months, most of the sections below are organized into three parts: (1) prior to the 1990s, (2) during the 1990s, and (3) what was planned to begin in August 2001.

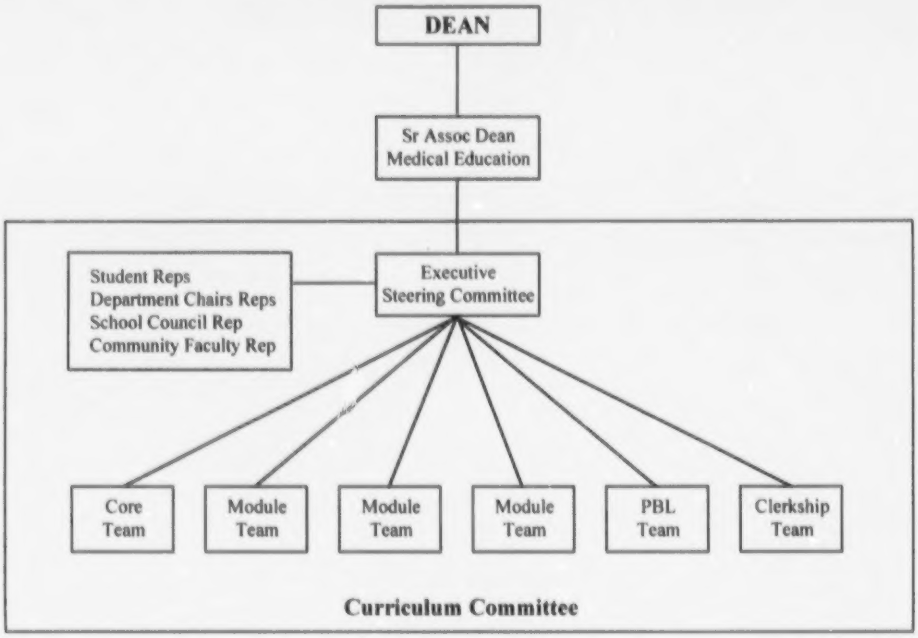
Curriculum Management and Governance Structure

- Prior to the 1990s the deputy dean for medical education was charged with strategic and tactical responsibility for medical education. The curriculum committee, a standing committee of the school council, was largely advisory to the dean and rarely proactive.
- During the 1990s the curriculum committee became much more proactive and developed working subcommittees that made significant contributions in areas of evaluation, integration, and faculty development.
- The curriculum committee was largely a group of faculty who did not have much involvement with the school's courses and typically would represent their departmental interests as well as the overall school's needs.
- During the 1990s the deputy dean for medical education and the administration continued to perform significant strategic as well as tactical functions.
- The school also created an integrated Office of Generalist Education in Medicine (GEM) that managed significant segments of the medical student programs. This office gave many of the faculty and departments involved with medical student learning a forum where large amounts of educational time were available for generalist curricula across all four years of the curriculum.
- Although the curriculum committee approved all changes in allocation of time to various courses, within the course time allocated to generalist education changes were considered and implemented by the GEM group. This removed a significant potential barrier to innovation and experimentation.
- An example of the increased flexibility of the interdisciplinary generalist curriculum is the success in designing and implementing longitudinal integrated curricular themes as part of the school's UME-21 project. Had these changes been forced through the usual curriculum committee process, we probably would have been unable to garner enough time or the cooperation required to adequately address these content areas.
- As shown in Figure 1, as part of the curricular reforms, there are plans to change the governance of the educational programs.
- As the curriculum moves to an interdepartmental course structure, the authority for planning and managing the curriculum must move away from the departments and towards a centralized office.
- An executive steering committee will be created for the educational program. This committee will be responsible for planning, implementing, and monitoring the curriculum. This committee will consist of five faculty who each serve a three- to five-year term and who will be paid for these education–administrative efforts.
- The curriculum committee will be composed of faculty who have professional goals and daily responsibilities in medical education, i.e., the leaders of the various modules in the new curriculum, as well as representatives from the department chairs, the school council, and each of the medical student classes.
- In pursuing the attempts to budget the educational mission of the school, the executive steering committee will also have budgetary responsibility for the educational programs. Department chairs will no longer receive lump sums for their teaching efforts.
- Dollars will flow to the departments based on the actual quality and quantity of the teaching efforts. This will facilitate appropriately rewarding faculty for their educational efforts and increase the likelihood that they will participate in interdisciplinary courses outside their own departments' purviews.

Office of Education

- The school has had an Office of Medical Curriculum for several decades. This office has provided some operational support to the course directors and faculty.
- The school established the Office of Biomedical Computing in 1987 to support the technology needs of stu-

FIGURE 1: Curriculum Governance



dents and faculty in their educational and other professional activities. This office has provided some support for faculty development in the area of computers.

- In 1999, a new senior associate dean for medical education was appointed. This new dean brought an evaluation and design specialist (PhD) in education into the school and enhanced the school's talent in the area of information technology.
- A large component of the curricular reform initiative is the creation of robust support services in the Office of Medical Education.
- These plans include the implementation of educator portfolios to support and promote the education efforts of the faculty in conjunction with promotion.
- Faculty development is an important component of the new curriculum's needs and will be a priority in 2000 as the school moves towards new teaching and evaluation methods.

Budget to Support Educational Programs

- Prior to the 1990s the school's central education administration received an annual operational budget.
- All other monies for support of the educational programs were given directly to the department chairs as part of a larger annual allocation from the dean. Typically, these allocations were not directly linked to actual effort.
- There was no attempt to earmark components of these annual allocations specifically for student teaching.
- It was strictly a chairman's prerogative to decide how these dollars were used within the department.
- These funds were from the dean's central funds that were derived from tuition, per-capita state allocations for students who are Florida residents, dean's taxes, and gifts.
- During the 1990s annual allocations were given by the dean to department chairs as described above; there were some attempts to actually link some of the allocations to teaching efforts, especially in the Department of Medicine.
- The dean gave dollars to the interdepartmental Generalist Education in Medicine program that allocated support to faculty and departments who actually participated in its interdisciplinary courses.
- The school is now in the process of budgeting the education mission and designing a process for the allocation of education dollars to faculty and departments based on their actual efforts and program costs.
- This year (FY2001) the dean's allocation is being redistributed to several departments based on a weighted measurement of each department's teaching efforts.

- The education dollars will be passed through the office of the senior associate dean for medical education.

Valuing Teaching

- Prior to the 1990s no formal mechanism existed.
- Annually, each class of students selects the best teacher for an award. These awards are highly valued, even if they are based largely on popularity.
- Frequently more senior faculty were given responsibility by default for overseeing student teaching programs. There was a frequent turnover of course coordinators.
- During the 1990s the clinician–educator track was developed and large numbers of faculty were recruited to this career path.
- Other faculty became more active in national groups devoted to student education and served as credible examples of successful clinician–educators (as opposed to clinicians alone).
- Several faculty recruited and mentored early in their careers to pursue undergraduate medical education as a viable professional endeavor have succeeded thus far.
- In 1995, the faculty began to recognize those most successful and committed educators with the annual Teacher of the Year award.
- In the near future, programs in faculty development will be implemented and educator portfolios established to support the educational activities of the faculty.
- Efforts to budget the education mission will also bring concrete value to education efforts.
- Recently, the university's Board of Trustees issued a mandate that all colleges formalize a system of evaluation for all faculty in undergraduate and graduate teaching and report annually to the board. This requirement will also enhance the recognition of those faculty who actually do the teaching and administer the courses.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Prior to the 1990s the school was not outcome-centered in its education programs.
- Most courses did not even provide learning objectives to students.
- During the 1990s most courses created learning objectives to help students and faculty planners appreciate what the instructors felt was important. However, there was not always a strong link between objectives and assessment.
- The generalist initiatives in the mid-1990s provided opportunities to set outcomes at the end of the third year that were tested in the OSCE exercises, which began in 1996.
- As the new curriculum is developed, the faculty are forced to explicitly describe the outcomes in which graduates must demonstrate competency.
- As basic science and clinical faculty work together on the integrated modules, they are forced to ask tough questions regarding the relevance and timing of content.
- Developing these educational outcomes will prove to be one of the greatest rewards of the curriculum reform efforts, regardless of the final product.

Changes in Pedagogy

- Prior to the 1990s there was a very traditional curriculum, largely lecture-based, with typical labs in anatomy (dissection), histology (microscopes), and physiology (dog lab).
- There were occasional small-group seminars and workshops in several courses.
- During the 1990s the curriculum moved towards small groups and more paper-case–based activities, especially in the clinical skills program in the first two years and in several of the core third-year clerkships.
- The longitudinal clinical skills courses allowed us to use clinical cases in small-group exercises led by generalist clinicians wherein the clinical content was selected to correlate with the material in the concurrent basic science and pathophysiology courses.
- A major theme of the curriculum reform initiative is to move towards self-directed adult-style learning methods.
- Limits have been placed on the number of lecture hours per week (fewer than nine); five hours of small-group sessions per week will be required.
- A 12-week block of traditional problem-based learning is planned at the end of the second year as a transition to the clinical clerkships.
- As described next, information technology will play a significant role in the students' learning in the new curriculum.

Application of Computer Technology

- The school established the Office of Biomedical Computing in 1987 with the charge of supporting and promoting the use of computer technology in biomedical education.

- This office established microcomputer labs and early e-mail accounts, and offered instruction to students and faculty beginning in 1988.
- The school provided ongoing resources and support in biomedical computing to students and faculty.
- Enlarged and improved computer labs were built in the 90s.
- The large medical student auditoriums were equipped with computers and large projection systems capable of digital teaching as early as 1994.
- Several faculty, especially in anatomy, histology, and embryology, developed their own computer-assisted lessonware and used it in their student teaching.
- All students were given instruction in the use of Medline, Web browsing, word processors, spreadsheets, and graphics programs beginning in 1988 and continuing throughout the 1990s.
- The new curriculum will emphasize self-directed learning and the use of evidence to formulate decisions and actions.
- The school is currently installing the infrastructure to support Web-based learning, interactive teleconferencing from desktop browsers, and asynchronous Web-based communications via listservs and discussion groups. All of these computer-based services will be important components of our new curriculum.

Changes in Assessment

- Prior to the 1990s the program relied heavily on written examinations, often multiple-choice, leading to a summative grade.
- The school has used pass/fail; standard letter grades; and a system of honors, high pass, pass, marginal, and fail at various times in the past.
- In 1996 the school converted to a numeric grading system using a percentage score.
- Each student received a final grade between 0 and 100, indicating how many points out of a course total were earned.
- In the 1990s many of the core clerkships began including oral examinations in their grading systems.
- In 1996, the school introduced an OSCE exercise using professional patients at the end of third-year core clerkships.
- All students must participate in the OSCE. Individual areas of strength and weakness are identified.
- Students with broad areas of deficiency are monitored during the fourth year.
- In the new curriculum, a variety of assessment methods will be used.
- In addition to written examinations there will be small-group evaluations, peer evaluations, self-evaluations, standardized patients, and enhanced OSCEs.
- Students will receive a final grade for each course (likely pass/fail) and an extensive narrative for each course describing strengths, weaknesses, and accomplishments.

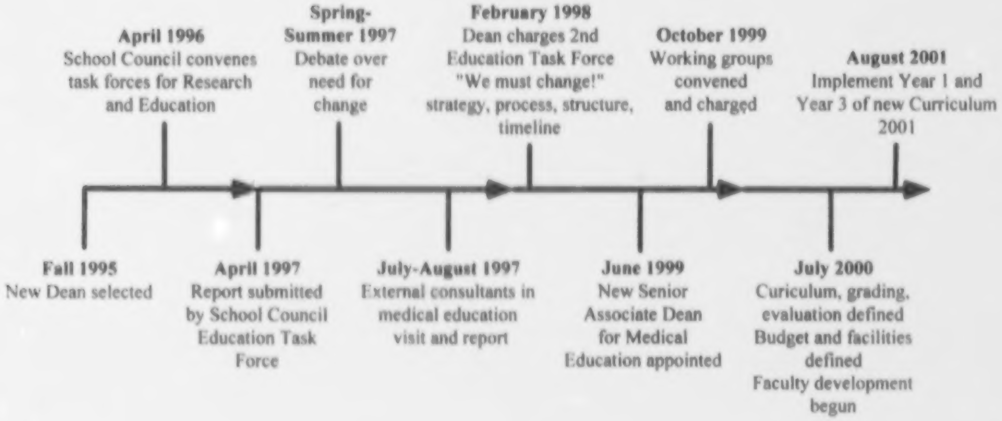
Clinical Experiences

- The school has always been blessed with an abundance of clinical opportunities for our students. Prior to the 1990s, most of these clinical experiences occurred after the second year.
- There has been a first-year home-visit program for the students since the early 1980s. Every first-year student visits a patient and the patient's family in their home repeatedly during the first year of medical school.
- The two-year longitudinal clinical skills program was established in 1990. Since then, every student has been assigned a primary care community practice site and spends regular sessions there throughout years one and two (one afternoon per week in year one and every other week in year two).
- The community voluntary faculty provide an invaluable resource for the students and the education program.
- In 1990, the school required that each clerkship provide clinical experience in ambulatory care for all students.
- Two required clerkships use community ambulatory sites for student learning.
- Family medicine places students with private family physicians.
- The Generalist Primary Care clerkship places students in community health centers in underserved areas of Miami–Dade county.
- Plans are to continue all of the above programs in the new curriculum.

Curriculum Review Process

- The current curricular reform initiative has provided the impetus for complete review of our curriculum. (See Figure 2.)
- Currently, the school's curriculum committee performs periodic reviews of existing courses on a rotating basis.

FIGURE 2: Curricular Renewal Timeline


April 1996
School Council convenes task forces for Research and Education
Spring-Summer 1997
Debate over need for change
February 1998
Dean charges 2nd Education Task Force "We must change!" strategy, process, structure, timeline
October 1999
Working groups convened and charged
August 2001
Implement Year 1 and Year 3 of new Curriculum 2001
Fall 1995
New Dean selected
April 1997
Report submitted by School Council Education Task Force
July-August 1997
External consultants in medical education visit and report
June 1999
New Senior Associate Dean for Medical Education appointed
July 2000
Curiculum, grading, evaluation defined
Budget and facilities defined
Faculty development begun

These reviews are somewhat open-ended, without explicit performance criteria.

- With major curricular reform, plans are to establish rigorous criteria for evaluation of our successes and failures.
- Through assessments linked to the educational outcomes, faculty will identify areas of strength and weakness in the curriculum.
- These evaluations will include student assessment (exams, OSCEs, peer and self evaluation), external reviewers, and extramural benchmarks (boards).
- The new curriculum committee, the executive steering committee, and the PhD in medical education responsible for evaluation will direct these efforts.

Future Goals

- Our priorities in the next five years are largely defined by the blueprint for our curricular reform initiative. We will present an integrated, case-based curriculum that fosters self-directed learning and utilizes service-learning experiences. We will continue to emphasize our areas of strength, including: geriatrics, cultural and ethnic diversity, and community service and volunteerism. We will work to develop successful educational programs in genomics, Web-based and distance learning, and international health.

University of South Florida College of Medicine

STEVEN SPECTER, PHD

Curriculum Management and Governance Structure (See Figure 1)

- The educational program is overseen by the Committee on Curriculum (CC) and the Office of Curriculum and Medical Education (OCME).
- The CC meets monthly and reviews every required course at least once every two years. Courses deemed to be of concern may be reviewed annually. The CC has been expanded from nine to 12 faculty members within the past two years; in addition, there are student representatives of each of the four classes in the undergraduate educational program. The committee has spent considerable time over the past two years re-evaluating the overall curriculum structure.
- The CC and OCME are under the direction of the associate dean for academic affairs (who is also vice dean of the college), as delegated by the dean of the College of Medicine.
- In 1992 an associate dean for academic affairs was appointed. From 1992 to 1996 the position varied from a 0.5 to 1.0 FTE position.
- In 1996 a 1.0 FTE associate dean for academic affairs was re-established. This person is responsible for overall supervision and operation.

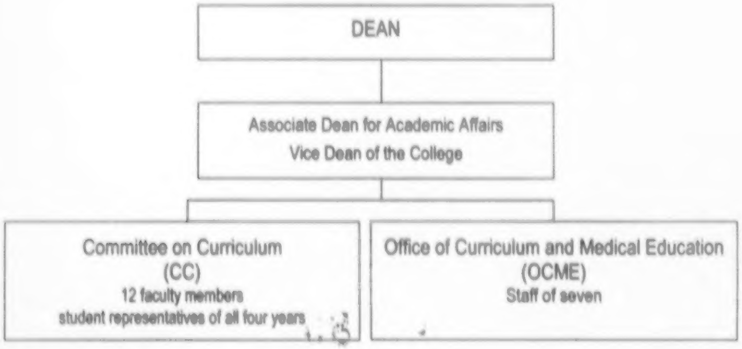
Office of Education

- The OCME was established in July 1997 to assist the associate dean for academic affairs in curricular oversight.
- The office is directed by the associate dean for pre-clinical education and the associate dean for clinical education, who are each appointed for 0.5 FTE and were appointed in 1997.
- The deans have direct oversight of the CC and are charged with implementing the CC recommendations that are accepted by the dean of the college.
- The OCME coordinates all curricular activities and acts as the liaison among the students, faculty, and administration on curricular issues.
- The office is also charged with implementing computer technology in the curriculum, teaching development workshops for faculty, coordinating interdisciplinary courses, and coordinating responses to AAMC and LCME requests regarding the curriculum.
- The personnel, in addition to the associate deans, consist of a staff of seven, as compared with 0.5 FTE in 1996.

Budget to Support Educational Programs

- There are specific funds to support teaching development, staff development, standardized patients, and teaching incentive funds for faculty teaching innovation, in addition to the funds necessary to operate the OCME.
- Funding was established by the associate dean for academic affairs in consultation with the dean.
- The funding sources include a blend of state funding, practice plan funds, and other discretionary funds provided by the dean.

FIGURE 1: Governance Structure


DEAN
Associate Dean for Academic Affairs
Vice Dean of the College
Committee on Curriculum
(CC)
12 faculty members
student representatives of all four years
Office of Curriculum and Medical Education
(OCME)
Staff of seven

Valuing Teaching

- Faculty members involved primarily in the educational program are identified via their official department assignments of responsibilities and by self-identification to the administration.
- Recognition is through selection of faculty for outstanding teaching awards that were established in 1999.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- There are college-wide objectives, consistent with the MSOP Objectives that are tied to competencies expected at graduation. [The list of learning outcomes is available from the author.]
- These general competencies are tied to course-specific competencies that are developed for each course/clerkship by those involved in teaching. [The list of competencies is available from the author.]
- The competencies are reviewed and recommendations for approval made by the CC; these are reviewed for final approval by the dean.
- The process for determining outcomes includes written exams to test knowledge, practical exams to assess skills and attitudes, and observation to test all three.
- Written exams are given in all required courses.
- Practical exams are given in anatomy, pathology, and medical microbiology; clinical skills exams include an OSCE (year two), a clinical practice exam (year three), and a videotaped history and physical exam (year four).
- Faculty and residents evaluate students subjectively in every course/clerkship.
- External outcome measurements are used, including NBME mini-board exams in a few basic science courses and five clerkships and requirements to pass USMLE Steps 1 and 2 to be promoted to year three and to graduate, respectively.
- The AAMC graduation questionnaire and evaluation of students' abilities after one year of residency by the graduates and their supervisors are used to continuously monitor outcome perceptions of graduates.

Changes in Pedagogy

- During the last decade there has been a movement to shift hours of the classical lecture format to more active learning modes. This has been a gradual evolutionary change.
- Small-group learning is used in virtually all of the courses in years one and two to some extent.
- Wet labs are still used in some courses.
- More interdisciplinary teaching has been developed.
- All basic science courses have some clinical correlations, which are designed to demonstrate more effectively the clinical relevance of basic science concepts, developed and taught jointly by clinical and basic science faculty.
- Specific curricular changes since 1991 are
  - decrease in total numbers of curricular hours in years one and two by 21%
  - increase in small-group learning in basic science courses
  - increase in number of clinical-correlation sessions in basic science courses
  - increase in ambulatory care training in year three clerkships
  - initiation of interdisciplinary courses in neurosciences and in molecular biology and human genetics—mid-1990s
  - establishment of family medicine clerkship
  - merging of gross anatomy and embryology into a single course
  - initiation of problem-based learning course in 1992
  - physical diagnosis spread over three terms—from year one, spring term, through all of year two
  - coordination of the physical diagnosis and Introduction to Clinical Medicine courses in year two
  - feedback from use of standard evaluation forms for all required courses/clerkships, which has helped in curricular changes
  - developing on-line curricular materials
  - establishment of competencies for all courses/clerkships year one to three
  - establishment of critical care clerkship in 1999
- Small groups make up about 10% of curricular hours in years one and two.
- The problem-based learning course (one semester, year two) that was established in 1992 is solely small-group learning.
- Case-based learning is used in many courses to introduce concepts in lecture and small-group settings.
- There is some limited use of standardized patients for teaching in the Introduction to Clinical Medicine and in physical diagnosis.
- A moderate array of standardized patients have been

trained and are used for assessment in the OSCE (year two), clinical practice exam (CPX) (year three) and videotaped history and physical exam (year four).

Application of Computer Technology

- Every student is required to purchase a laptop computer based on specifications determined by the Health Sciences Center Information Services in consultation with Student Affairs and OCME.
- Computers are used throughout the curriculum in a variety of ways.
- There is an Intranet server devoted to curricular content.
- Each course has its own site that is used to post curricular content, syllabus, schedule, objectives, lecture outlines, practice exams, case-based exercises, laboratory exercises, communication among students and faculty, Web resources, and libraries of images. The use of such materials dramatically varies among courses, but use increases each year; some courses have all of their materials on the site, while some others do not yet use the site.
- The use of Power Point to enhance lectures is also increasing.
- The third- and fourth-year students have an electronic logbook for recording their clinical experiences. The responses are used to chart the students' overall clinical experiences and to help determine what diagnoses and clinical procedures they experience individually and as a group to assist the faculty and administration in modifying content.
- All course evaluations are administered electronically via OCME using a standard evaluation format for courses and clerkships.
- An audience feedback program was developed by OCME to use in class for interactive teaching.
- Ungraded practice quizzes have also been administered on-line.
- Students use a separate server to post their note service, and this server is also used by some faculty to post their class notes.
- There is a program for faculty, students, or administration to survey students' opinions on any issues of importance.
- Most official communication with students regarding course announcements, information, etc., is via e-mail.

Changes in Assessment

- Change has occurred in a regular evolutionary manner over the past decade. There have been practical exams to better assess student skills established for years two, three, and four.
- Standardized patients are used for the OSCE (year two), the CPX (year three), and the videotaped history and physical exam (year four).
- Faculty observation is used for the practical exams in clerkships and in small-group settings in years one and two.
- Comprehensive exams are achieved via year two OSCE and year three CPX.
- A clinical practice examination is given; history and physical examination are videotaped.
- Performance is reviewed with the student by a faculty member, and deficiencies are remediated until outcome is satisfactory or better.

Clinical Experiences

- Student clinical experiences begin in the first semester of year one and include in-class sessions with patients followed by shadowing in physicians' offices in the community or with third- or fourth-year medical students in clinical settings.
- In year two there are preceptorships in the community physicians' offices.
- In year two there is an optional program of service in community health clinics serving the underserved.
- In year three students are in clinics and wards, and via the USF AHEC there is experience in underserved rural clinics.
- In year four there are required clinical experiences in neurology and in critical care units (ICU, CCU, surgical ICU) in hospitals.

Curriculum Review Process

- Review of the educational program began in fall 1997.
- Through curricular retreats in 1998 the CC determined that review of the curriculum by the students, faculty, and administration was in order.
- In 1999 a series of three retreats coordinated by OCME, involving more than 100 faculty, students, residents, staff, and administrators, made recommendations for change to the CC. The CC reviewed these recommendations, endorsed them, and sent them to the dean for approval.
- The changes were accepted by the dean and the implementation process began in January 2000.
- Once the new curriculum is established there will

be twice-yearly review sessions by the CC to examine the efficiency and effectiveness of the overall curriculum.

- The themes and goals of the curriculum renewal effort include
  - increased integration of basic and clinical science teaching across all four years with more interdisciplinary teaching
  - stronger professionalism/humanism curriculum
  - early longitudinal clinical experience
  - less lecture, more active learning
  - strong mentoring program
- Goals

To pursue excellence in the educational program for the MD degree through an interdisciplinary, integrated four-year curriculum that promotes

  - self-directed, lifelong learning
  - learner-centered instruction and other educational experiences
  - skills, knowledge, attitudes, and values necessary for the successful practice of medicine in the 21st century
  - a faculty-owned, college-wide program that
    —incorporates innovative teaching and learning activities
    —is competency-driven
    —incorporates integration of basic science and clinical medicine
  - outcome-based promotion based on demonstration of competency related to
    —knowledge
    —skills
    —attitudes and values
- The design of the process used (or under way) was:
  - January 22, 1999—curricular retreat
    —participation of faculty, students, alumni
    —the need for change, value of change, mechanisms of change
    —current models of medical school curricula
    —creating a philosophy for our curriculum for the 21st century
  - February 1999
    —Creation of work groups (faculty and students) to develop the curriculum
  - February 1999–October 1999
    —Curricular design planning
    —Feedback from faculty and students
    —Continue ongoing program of teaching development workshops
    —Recommendation to the CC by the work groups
    —Recommendations by CC to dean
  - January 2000
    —Acceptance of plan by the dean
  - January 2000–July 2001
    —Content work groups design specific courses
  - December 2000–July 2001
    —Ongoing review of curriculum for approval by Faculty Council, Executive Council, dean
  - July 2001
    —Implementation of curriculum
  - January 2002–2005
    —Ongoing evaluation of curriculum
    —Adaptation to needed changes
    —Reports to faculty and dean
- As a result of the retreats and work groups and the CC recommendations, the changes to the curriculum will include
  - a three-week introductory block in year one with emphasis on humanism/professionalism and basic medical skills
  - a longitudinal clinical experience extending over years one and two
  - a colloquium series a half-day per week for first-year and second-year students
  - a colloquium series half-day per week for third- and four-year students
  - increased interdisciplinary teaching and coordination of courses in all years
  - greater integration of clinical medicine into first- and second-year courses
  - greater integration of basic science into year three and year four clerkships
- OCME has been provided by the dean the resources to guide the process and assist with implementation by way of an education specialist and administrative assistant and a program assistant.
- Challenges include(d) getting faculty who are resistant to change to participate in the process, freeing sufficient time for clinical faculty to participate more in interdisciplinary teaching, finding sufficient numbers of good community preceptors to accommodate all of our year one and two students in the longitudinal clinical experience, finding funding to support all of the innovations that faculty and students develop in the planning process.
- The educational specialist is charged with assisting the associate deans for education in development of tools to evaluate the changes to the educational program. These still need to be developed. The standard evaluations used by students as well as performances on internal and external exams will be part of this process.
- The process of curricular review has been in place for many years.

- The CC reviews all courses individually once every two years or more frequently if there is a need.
- The CC also has examined and helped establish new college-wide objectives (in 1999) and course-specific competencies (1999). Discussion of the overall educational program will be addressed twice yearly in half-day retreats, or more frequently if the need is determined.
- Over the next five years the review will be likely to focus on the implementation of curricular change and making adjustments as implementation proceeds.

Emory University School of Medicine

JONAS SHULMAN, MD

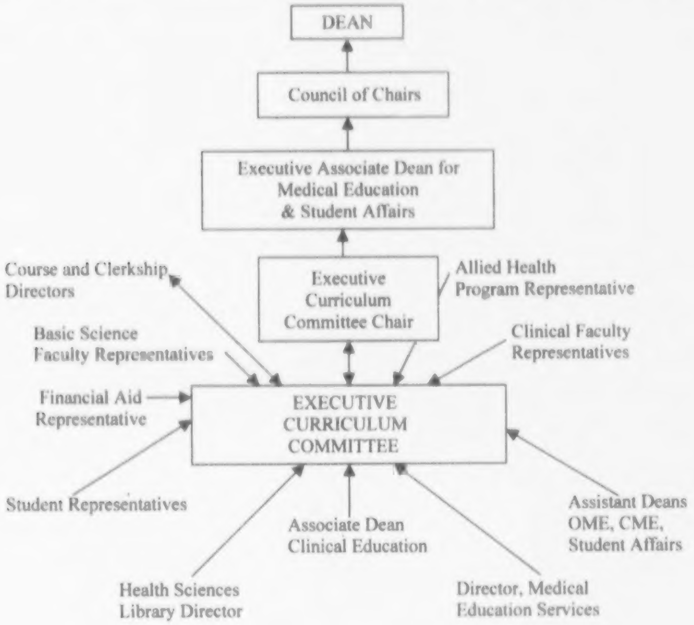
Curriculum Management and Governance Structure (See Figure 1)

- The chairman of the Executive Curriculum Committee reports to the executive associate dean for medical education.
- The Executive Curriculum Committee is chaired by a member of the faculty (not a department chair) and consists of 20 to 30 faculty members representative of basic science and clinical departments.
- The members of the committee are selected from clerkship directors or other faculty (but not department chairs) involved intensively in the teaching program.
- Ex officio members of the committee include the deans in the Office of Medical Education and Student Affairs and the Director of Medical Education Services.
- The administrative assistant supporting the committee attends all meetings, records minutes, and maintains detailed files.
- Rotating members include four students, one elected from each class, who represent the combined course and clerkship student curriculum representatives for their class years.
- Most recently the head of the Health Sciences Library and a member of the Allied Health Programs faculty have been added to the committee.
  - The committee must meet at least ten times during the year, usually monthly, and is charged with the responsibility to
  - understand, analyze, and coordinate the entire four-year curriculum and to monitor the quality of the basic science courses and clinical clerkships;
  - detect problem areas or weaknesses in the curriculum and assist in assuring that the problems are corrected;
  - obtain continuous student input to verify students' views of the success of the courses and clerkships and of the quality of the overall educational program;
  - detect unwanted repetition as well as any topics of importance that are missing from the curriculum;
  - review USMLE results and other external examinations such as the results of National Board subject examinations;
  - review the objectives of each course and clerkship and to help determine the extent to which they are being achieved;
  - review the evaluation process developed for each course and clerkship;
  - recommend changes in clerkship content and identify courses or topics that need to be added or eliminated;
  - review proposals for new or additional topics/subjects submitted for consideration of incorporation into the curriculum and recommend action on the proposal;
  - monitor the overall effectiveness of each year of the curriculum and determine that courses are presented in a reasonable sequence; and
  - review each required course and clerkship at least every 18 months; overviews should be presented by the course/clerkship directors in the presence of their department chairs and their student curriculum committee representatives and should include objectives, evaluation methods, and perceived strengths and weaknesses.
- The Executive Curriculum Committee works closely with the executive associate dean, who in turn interfaces with the dean. Serious problems are to be brought to the attention of the dean and the Council of Chairs.

Office of Education

- In 1990 the school established the Office of Medical Education, which has responsibility for coordination and development of curriculum and teaching.
- The office is headed by an MD at the full professor/executive associate dean level who oversees the entire curriculum. This individual is assisted by a part-time associate dean for clinical education based at our Grady Campus who pays special attention to the third and fourth years.
- The office grew out of a major successful curriculum revision in 1992, which was reviewed in detail within a strategic planning process in 1998–1999 and resulted in additional recommendations. [A copy of the Teaching and Education Strategic Plan is available upon request.]
- An Educational Advisory Committee led by the executive associate dean has been established and is in the process of assuring and assessing implementation of this plan.
- In 1999 four additional part-time assistant deans (MDs) were added to the Office of Medical Education with responsibilities in the areas of medical education and student affairs. These individuals have been involved in

FIGURE 1: Office of Medical Education/Curriculum Management and Organizational Chart


DEAN
Council of Chairs
Executive Associate Dean for Medical Education & Student Affairs
Course and Clerkship Directors
Executive Curriculum Committee Chair
Allied Health Program Representative
Basic Science Faculty Representatives
Clinical Faculty Representatives
Financial Aid Representative
EXECUTIVE CURRICULUM COMMITTEE
Student Representatives
Assistant Deans OME, CME, Student Affairs
Associate Dean Clinical Education
Health Sciences Library Director
Director, Medical Education Services

curriculum enhancement, student and faculty mentoring, development of standardized patient programs, improving informatics, ensuring adequate research opportunities, reviewing course and clerkship objectives, and improving evaluation tools for our curriculum and for our students.

- In 2001, a PhD educator will be added to our staff.

Budget to Support Educational Programs

- There is a descrete budget for the School of Medicine to support our office operations and personnel.
- The major support for teaching is via the dean's Ledger I Budget to individual departments. This recently has been substantially supplemented for faculty who are involved in major teaching roles, especially course directors, and for faculty who participate in interdepartmental and extra-departmental teaching (e.g., Department of Medicine faculty with teaching responsibilities in the pathophysiology or pharmacology course).
- The Office of Medical Education is responsible for assuring that these additional funds are utilized appropriately by the various departments.

Valuing Teaching

- The school has developed several programs and incentives to train academics to be better teachers, to stimulate clinicians and researchers to teach, and to recognize and reward excellence in teaching.
- During December 1999, a two-day Faculty Development Seminar was held for all new medical school faculty. Funded by the Emory University Teaching Fund, this well-received workshop for new faculty will be an annual event.
- Additional faculty development is now being planned by a committee under the leadership of one of our assistant deans.
- The dean has created a fund dedicated to help support undergraduate medical school teaching, especially in clinical departments. During this academic year, this substantial fund will be distributed to department chairs to bolster medical student programs.
- Beginning in 1998, all faculty members were asked to develop teaching portfolios. An application for faculty appointment or promotion must be accompanied by a teaching portfolio documenting teaching activities.
- Each year, senior medical students recognize a clinical and basic science faculty member for teaching excel-

lence, and individual classes recognize their best teachers in each year of medical school.

- The school has one annual Distinguished Teaching Award with financial remuneration (close to $20,000) that is awarded at commencement.
- Several teaching awards are also given at the university level. Medical school faculty are eligible for these and have been awarded them in recent years.
- In 2000 the dean created a fund to provide at least $5,000 to each of ten to 20 faculty members determined by a committee of peers to have served the teaching mission of the medical school with particular distinction during the preceding year.
- Each year a faculty member who has contributed to medical student teaching is elected to Alpha Omega Alpha.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school has set institutional objectives to develop leaders in medicine, science, and clinical care. This was done by establishing an educational program that promotes the following vision and learning outcomes:
    - promote lifelong learning by focusing on skills required for independent thinking and scholarship;
    - emphasize a preclinical curriculum that focuses on a strong foundation in the basic sciences;
    - on this foundation is built an understanding of the mechanism and management of disease;
    - communication skills, moral and ethical behavior, and ethical and professional dilemmas are confronted, defined, and assessed;
    - endorse a commitment to public health and community service;
    - provide opportunities for scientific inquiry and research;
    - promote efficient and accurate assessment of the medical literature; and
    - emphasize the highest standards of professionalism and medical care to patients and community.
- Promotion to the next semester or next year of course work requires successful passage of the composite "joint examinations" offered regularly throughout the first four semesters. These examinations encompass the basic science core courses (anatomy, biochemistry, neurobiology, physiology, cell biology and histology, pathology, pathophysiology, microbiology, pharmacology, human behavior).
- A grade of "F" in any one course precludes promotion to the next semester. A grade of "D" requires careful review by the Progress and Promotions (P&P) Committee, and promotion is viewed contextually with the student's performance in other concurrent courses. The P&P Committee meets at least once each semester. Students are discussed at the committee meeting if they have academic, behavioral, or professionalism problems.
- Additional outcome measures include:
    - A portion of the student's final grade in pathology, biochemistry, and physiology is determined by the student's performance on the NBME shelf examination, allowing comparison with medical students across the country.
    - Promotion to the third year of medical school requires a passing score on Step 1 of the USMLE.
- During the third year, each clerkship director is responsible for generating a list of core learning objectives for the medical students.
- Throughout the third year, the unifying themes are routine assessment of clinical skills, patient management, communication skills, professionalism, and interpersonal skills. While there may be some variability in patient mix, the educational expectations and evaluations are the same across all clinical sites.
- The students receive an orientation the first day of each rotation, and the objectives and expectations are clearly delineated. Each clerkship requires a written final examination, with most relying in part on the NBME shelf examination. The final grade is a compilation of the student's overall clinical performance and shelf exam score.

Changes in Pedagogy

- Six years ago, in response to faculty requests for increased small-group teaching, the school built/renovated seven small classroom/seminar rooms that are now used extensively during the first and second years of medical school.
- Along with pre-existing space, the rooms are now utilized by many course directors for small-group processes that complement or replace lecture time.
- Courses that employ small groups include biochemistry, cell biology, genetics, physiology, pathophysiology, pathology, and problem-based learning.
- Problem-based learning is a mandatory course conducted during the first and second years.
- Case presentations are included in most basic science courses.
- Beginning 1999–2000 the school has employed standardized patients to evaluate second-year students in their focused history taking and physical diagnosis skills.

- It is expected that additional appropriate video- and audio-equipped rooms will be developed within the next several years to expand the use of standardized patients for teaching and evaluation.
- Medical Decision Making, a course offered in the first year, emphasizes techniques to both access and analyze current medical literature. Students abilities to analyze the methods, statistics, results, and conclusions of medical papers are formally assessed.
- Basic Life Support (BLS) is taught in the first year and follows the American Heart Association standard course. Students must meet the standards of the AHA to be certified as BLS providers.
- In the second year, students are rigorously taught interviewing and physical diagnosis. Periodically, as the skill set is built throughout the year, every student performs a faculty-observed history and physical examination of a patient.
- Throughout the third year, the interdisciplinary Clinical Medical Ethics course is interwoven through the curriculum. In this course, trained faculty preceptors specifically address end-of-life issues, physician impairment, confidentiality, competency, futility, and other commonly encountered ethical and moral dilemmas. These are small-group sessions that require active participation from each student, with case analysis and "homework" assignments.
- Advanced Cardiac Life Support (ACLS) is a mandatory portion of the third-year curriculum and follows the American Heart Association standard course objectives and outcomes. Students must successfully pass a written examination and multiple skills stations to receive certification as ACLS providers.

Application of Computer Technology

- Although students are not required to own computers, a computer lab with 30 computers dedicated to medical student use is available on the main Emory medical campus.
- Many computers are available to students at the Grady campus and provide additional access.
- Major computer facilities are available to students in the Health Sciences Library and on a 24-hour basis in the Emory University Computing Center located nearby.
- Computer technology (information technology) was identified as a priority in the Teaching and Education Strategic Plan (TESP) as reported in January 1999.
- Medical informatics currently occupies six hours as a formal curriculum topic. This course includes introductions to use of the Internet as a source of medical information, computer-aided learning in medicine, and management and decision-support systems as used in clinical medicine.
- Students become proficient at the use of a computerized medical record system at one the major teaching hospitals.
- Information technology as a resource for students and physicians is discussed in the evidence-based medicine course Medical Decision Making.
- Information technology is used as a teaching method in a number of basic science courses, most notably in cell biology (over 600 images) and neurobiology. The cell biology program is interactive, while the pathology program involves mandatory references to repositories of pathology images accessible through Internet sites.
- The pathophysiology course involves the use of CD-ROM–based cases.
- In the clinical years, information technology is used in the cardiology course using both "Harvey" and computer-based modules on heart failure and coronary artery disease. Obstetrics–gynecology also uses computer-based cases as a learning adjunct.
- Computer technology is an important means of communication among students, administration, and faculty. All students are given a "LearnLink" account, which facilitates communication between the three groups.
- LearnLink provides document management (all lecture transcripts are posted on LearnLink for students and faculty) and e-mail capability, as well as providing Internet access for students.
- Information technology is also being utilized as a way of analyzing and managing our curriculum.

Changes in Assessment

- Standardized patients are used in the second year as part of the evaluation process in the clinical methods course (physical diagnosis). Students are given a clinical scenario and are then expected to elicit the appropriate history and perform a focused physical examination. The entire patient encounter takes 25 minutes.
- Students are evaluated both by faculty and by standardized patients (for communication skills), each using defined criteria.
- A pilot program for fourth-year students using standardized patients began in the spring of 2000. Students have four standardized patient case encounters that involve history taking, physical examination, the generation of an appropriate differential diagnosis, and a SOAP note. As with the second-year program, faculty and the standardized patients will assess the students.

- Computers are not currently used as an assessment method other than for practice examinations on CD-ROM, which were recently developed for us by a visiting scholar from Sweden.
- Faculty observation is used during the first and second years through the small-group learning sessions in the problem-based learning course.
- Direct faculty observation of performance occurs during the second year clinical methods (physical diagnosis) course, and during the third- and fourth-year clinical clerkships. In these courses, faculty observe students perform comprehensive history and physical examinations and assess their clinical skills.
- Faculty currently evaluate second-year students, and plans have been made to evaluate fourth-year students during the standardized patient assessment programs.
- As an assessment method, OSCEs are used only in the standardized patient programs in the second and fourth years. OSCEs are used as a teaching adjunct for the gynecologic exam. We anticipate an increase in the use of OSCEs as a tool for both teaching and assessment in the near future.
- In the first and second years, students are evaluated in small-group sessions in the problem-based learning course that, in part, assesses communication skills, professionalism, team-building skills, and computer-driven literature searches for relevant patient-care related issues. The student-to-faculty ratio is 4:1 and faculty observation and feedback are mandated.
- Students' clinical performances are evaluated by the resident team members and the attending physicians with whom the students come into contact. Students perform independent history and physical examinations, write detailed history and physical examination assessments and plans, write daily progress notes that are part of the medical record, and present on rounds.
- During the pediatric nursery rotation, each student must pass a faculty-observed physical examination on a newborn.
- On the internal medicine clerkship, each student is required to perform and pass a faculty-observed history and physical on a hospitalized patient.

Clinical Experiences

- During the past five years, there has been a considerable increase in the ambulatory care experiences offered to students.
- A mandatory family medicine clerkship is now offered during the third year. Students spend one month with a clinician away from the Emory campus, where concepts of primary care are taught in the context of a community physician's office; approximately 60 local physicians participate in this program.
- Students have an opportunity to spend an additional month of community-based ambulatory medicine as an elective during the fourth year.
- Approximately one third of the first-year class takes a month-long preceptorship with a generalist physician in the summer after the first year.
- Students have extensive opportunities to train in Emory-owned and Emory-affiliated inpatient and outpatient facilities. These facilities include: Crawford Long Hospital (583-bed community-based tertiary care hospital); Emory University Hospital (587-bed multi-specialty adult care hospital); Wesley Woods Center (235-bed geriatric facility); The Emory Clinic (nonprofit 688-physician clinic); Children's Healthcare of Atlanta at Egleston Hospital (235-bed tertiary care children's hospital); Atlanta Veterans Affairs Medical Center (420-bed facility); and Grady Health System (953-bed tertiary care metropolitan hospital with extensive outpatient clinical facilities).
- The school has entered into a limited partnership with Columbia/HCA, which owns several hospitals in the Atlanta area. Educational programs are expected to develop in some of these facilities.
- Emory students take advantage of other non-Emory clinical facilities in the Atlanta area, as well as electives located in suitable facilities outside metropolitan Atlanta.

Curriculum Review Process

- Curriculum review has occurred in two ways over the past five years:
    - through a one-time, large-scale Strategic Plan for Teaching and Education that was started in 1998 and completed in 1999; and
    - through the monthly meetings of the Executive Curriculum Committee (ECC).
    - Through a third approach to curriculum review, initiated in the spring of 2000, a number of in-depth site visits to American and European medical schools occurred, with a view towards significant long-term change in Emory's approach to medical education.

Themes and Goals of the Curriculum Renewal Effort

- The goals of this effort include:
    - ensuring the quality of medical education

  - ensuring a process that links course objectives, content, teaching method, outcomes, evaluation, and feedback
  - redistributing the curriculum hours to provide more small-group interactions, more independent study time, and less lecture time
  - increasing the ambulatory care experience
  - integrating the teaching of the basic and clinical sciences
  - monitoring the need for and finding a place in the curriculum for new topics such as domestic violence, women's health, medical Spanish, and the socioeconomic aspects of medicine
- Strategic plan for teaching and education—Approximately 180 faculty, staff, and students were involved in this effort, which involved many meetings, benchmarking studies, surveys, and site visits to other institutions. Faculty and staff were predominantly from the School of Medicine but also represented the Schools of Nursing and Public Health, the teaching hospitals, and the larger university.
- Ten subcommittees were formed: Admissions, Curriculum, Graduate Education, Office of Medical Education and Student Affairs, Students, Facilities, Teaching and Faculty, Information Technology, Finance, and Allied Health.
- The ECC reviews courses/clerkships at its monthly meetings.
- Established courses are reviewed approximately once every 12 to 18 months, while new courses are asked to report progress on a more frequent basis.

Resources Needed

- The dean made the strategic planning process a priority for the medical school and as such allocated or otherwise obtained the necessary resources.
- Significant time was also devoted to this project by the Office of Medical Education, the executive associate dean for medical education and student affairs, the associate deans, and the director of medical education services.
- The dean's leadership was essential in obtaining the time commitment and subcommittee leadership from department chairs and senior faculty.
- The work of the ECC is supported by Office of Medical Education and Student Affairs staff. The Executive Associate Dean for Medical Education and the chair of the ECC set the agenda and detail the content of the replies to the presentations given by the course and clerkship directors.
- The implementation phase of this process formally began in the autumn of 1999; however, operational implementation of many recommendations of the Strategic Plan began immediately after its release.
- The resources required included financial and human resource commitments for recruiting additional Office of Medical Education staff; rewarding faculty for teaching; developing new educational programs; and planning a new medical education facility.
- Specific curricular needs included funds to investigate and pilot a standardized patient program, OSCEs, an expanded medical informatics course, and the hiring of an education specialist.
- Additional faculty involvement will be needed to oversee the implementation process. Once again, the dean's leadership and financial support are seen as essential to the success of this endeavor.

Challenges and Unanticipated Outcomes of the Process

- The challenges included maintaining organizational drive and faculty dedication for this sustained and long process. Emory has long had a traditional curriculum, and faculty often have been reluctant to entertain major change.
- The strategic planning process caused a sufficient number of faculty to seriously entertain and recommend major curricular changes and the resources that would be necessary to implement these changes.
- A major challenge for the ECC is the desire to optimize the overall curriculum. This is particularly difficult when the chairs and course directors each have their own sets of curricular priorities. Despite this, we have been impressed by their willingness to follow the recommendations of the ECC.
- Another unexpected outcome has been the overall receptiveness to student concerns of the faculty members of the ECC, the course directors, and the chairs. Numerous fundamental changes in courses have been made based on evaluation and student concerns.

Plans for Evaluation of the Change

- A Curriculum Oversight Advisory Committee is planned to view the curriculum from a more global perspective. Its role will be to oversee the curricular design from a level higher than that of an individual course and to better connect Emory to the educational offerings at American and other medical universities.
- The executive associate dean will take a four-month sabbatical to review several innovative programs at other

medical schools, with the intention of leading a major curricular revision in the following year.

- Database management of the curriculum is an ongoing process. Curriculum Oversight, Management and Evaluation Tool (COMET) is an organizational document for each course and clerkship, constructed as follows:
  - course title
  - contact information
  - departmental vs. interdisciplinary
  - location of course in the curriculum
  - credit hours
  - grading method
  - duration of the course
  - course description
  - objectives
  - emerging topics in health covered in the course
  - percentage ambulatory care, if any
- COMET allows faculty Web access to the objectives and contents of all the courses in the medical school. Plans are in place for significant expansion of COMET to include the course syllabus, lecture topics, etc.

Future Goals

- The major teaching and educational missions for the next five years are:
  - to create an environment where the value placed on medical student education and mentoring is enhanced;
  - to enhance the ambulatory care exposure and experience for students in the clinical years;
  - to enhance mandated skills assessment (standardized patients and objective structured clinical examinations);
  - to provide enhanced financial support and recognition for "great teachers" and support the integration of multidisciplinary courses;
  - to cultivate a faculty of "master teachers";
  - to enhance facilities to provide more space for small-group teaching, computer space, and OSCE examinations;
  - to enhance opportunities for all students to participate in basic and/or applied research;
  - to create additional opportunities for students in public and international health care practice and research;
  - to enhance students' ability to utilize computer technology and informatics to assist in learning;
  - to shift the educational paradigm from a "teaching" to a "learning" mode;
  - to consider major proposed curricular revision to compress the basic science curriculum to 18 months, allowing earlier exposure to clinical medicine with focused reintroduction of the basic sciences into the clinical years;
  - to reduce lecture time in the first two years and replace it with more varied learning experiences;
  - to hire a professional educator to assist the Office of Medical Education with evaluation tools, curriculum development, and testing methods;
  - to continue to enhance the school's information technology and technology support staff; and
  - to obtain reliable medium and long-term measures of graduates' competency, based on residency performance, fellowship training, and other achievements.

Medical College of Georgia

SUSAN PORTERFIELD, PHD

Curriculum Management and Governance Structure (See Figure 1)

- Management has become increasingly more centralized and less departmentally focused.
- The number of interdisciplinary courses has increased.

Office of Education

- There is a Curriculum Office that includes one PhD educator.
- A Center for Educational Excellence that will provide the structured educational support needed for academic programs is in development.

Budget to Support Educational Programs

- There are discrete budgets for certain components of the educational programs.
- The bulk of the cost of the educational program is included within departmental budgets.
- There is no clear division of funding sources within the individual departments.

Valuing Teaching

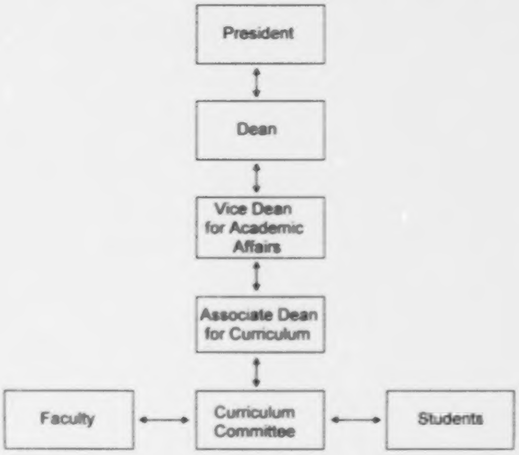
- Excellence in teaching is documented in an Educator's Dossier.
- The dossier is included as a factor in consideration for promotion, tenure, and salary increases.
- Faculty teaching awards to acknowledge teaching excellence are presented by both the student and faculty.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The learning objectives were derived from the AAMC Medical School Objectives Project objectives and were modified by the curriculum committees and faculty to meet the mission of MCG.
- [The list of learning objectives is available from the author.]

FIGURE 1: Curriculum Governance Structure



Changes in Pedagogy

- Small-group teaching sessions have been increased, though budgetary constraints may force a move away from small-group teaching in the future.
- Many courses use case-based teaching and it is expected that this will continue to grow.
- Standardized patients are used in teaching and assessment.

Application of Computer Technology

- Computers are not required, but the school recommends that students own laptop computers and most students have one.
- Computers are readily available in resource rooms, the library, and clinical sites.

Changes in Assessment

- Standardized patients are used in assessment.
- Some computerized testing is used.
- There is increased documentation of students' clinical skills.

Clinical Experiences

- Students spend time in private physicians' offices, community health centers, and large hospitals.
- Clinical training occurs in both inpatient and ambulatory settings.

Curriculum Review Process

- The curriculum committees study student evaluations and other curricular indicators, including the AAMC Graduation Questionnaire, and alter the curriculum accordingly.
- The new curriculum will be evaluated using
  - standardized systems for student evaluation of programs and faculty evaluation of students;
  - OSCEs;
  - behavioral assessments of the learning environment;
  - evaluations of performance of graduates by residency directors; and
  - meetings with recent graduates and the phase III curriculum committee to assess the strengths and weaknesses of the programs and develop strategies for changes.

Mercer University School of Medicine

ROBERT MOON, PHD

Curriculum Management and Governance Structure

- The founders of Mercer University School of Medicine (MUSM) visualized and designed a strategy for curricular development and management that was an extension of the matrix management philosophy generally used throughout the medical school.
- The faculty and the dean's office work closely together on development of policy and implementation of the curriculum.
- The dean delegates the bulk of responsibility for oversight, management, and implementation of the education programs to the associate dean for academic affairs and research. This individual works closely with faculty committees on curricular policy and design, and with various administrative chairs on implementation of the major components of the academic program.
- Curricular policy development resides primarily in the faculty and is overseen by the faculty-elected members of the Curriculum and Instruction Committee (CIC).
- This committee consists of seven members. Three members are from the clinical faculty (Constituency A), three from the basic science faculty (Constituency B) and one member from the volunteer faculty (Constituency D). A member of the library faculty (Constituency C) and student representatives from the second-, third-, and fourth-year classes also serve, without vote.
- The associate dean for academic affairs and research (ADAAR) serves ex officio without vote.
- The duties and responsibilities of the CIC are
    - to evaluate and make recommendations on the goals of the predoctoral programs as these relate to the mission of the school
    - to evaluate and make recommendations concerning content and process of all predoctoral curricula offered by the school
    - to evaluate and make recommendations on the appropriateness of contributions to the predoctoral curriculum
    - to evaluate and make recommendations on the effectiveness of methods used to deliver the predoctoral curriculum and to ascertain that ongoing teaching activities are consonant with the mission of the school
    - to receive and review all proposals related to content and/or evaluation of the predoctoral curriculum; to make recommendations on the implementation of both methods and standards of student evaluation and the dissemination of all information gathered from student evaluations
    - to consider and make recommendations on the appropriateness of contributions to the predoctoral curriculum by colleges and schools of Mercer University, community institutions, and external agencies
    - to receive recommendations on the overall predoctoral academic calendar
- There have been two long-standing subcommittees of the CIC that relate to the CIC for policy development and to the dean's office for issues of implementation.
- These committees are (1) the Phase Coordinators Committee, which has primary responsibility for oversight of the Biomedical Problems Program (BMP), and (2) the Clinical Clerkship Coordinators Committee (CCCC), which oversees the third and fourth years of the curriculum.
- *The BMP Program:* A BMP coordinator assists the associate dean for academic affairs and research (ADAAR) in the management of the curriculum. This person is appointed by the ADAAR and reports directly to that dean.
- One of the major responsibilities of the BMP coordinator is to chair the Phase Coordinators Committee.
- The Phase Coordinators Committee is composed of the phase coordinators from the 13 phases of the BMP curriculum. Phase coordinators are chosen from among the eight faculty members assigned to tutor a small group in a given phase of the BMP curriculum. The BMP coordinator chooses phase coordinators once the annual faculty teaching schedule has been finalized by the associate dean for academic affairs and research. Hence, in reality one role of the BMP coordinator is to be the "coordinator of coordinators." (The roles and responsibilities of the phase coordinators with respect to their individual phases are available from the author.)
- Details of overall policy and implementation of the BMP program are overseen by the Phase Coordinators Committee.
- Issues facing this committee transcend the entire gamut of policy and implementation issues that might arise as an offshoot of this complex administrative program.
- The BMP program is a truly interdepartmental faculty effort; the Phase Coordinators Committee represents the

entire BMP faculty, rather than just the basic medical science faculty, and becomes the major manager of the BMP program.

- While in the clinical departments the chair is administratively responsible for each clerkship, it is the BMP phase coordinator, rather than the chair of the Division of Basic Medical Sciences, who is responsible for the administrative oversight of the BMP program. This individual reports directly to the ADAAR.
- This unique administrative organization puts the chair of the Division of Basic Medical Sciences in the role of managing the individual faculty input for a substantial portion of the BMP program, including generation of cases, study guides, and MDE evaluations, while the overall policy and direction for the program are controlled by the BMP faculty, which consists of all tutors in the BMP program (both basic science and clinical faculty).
- Final policy decisions relating to the BMP program reside in the CIC. Any substantive policy recommendation regarding the BMP program must be forwarded to the CIC for approval before it can be implemented.
- Formal communication between the Phase Coordinators Committee and the CIC is through the associate dean for academic affairs and research.
- In reality, because of the small size of the faculty (there are only 22–25 basic science faculty), a substantial number of the basic science representatives on the CIC are usually also phase coordinators.
- The CIC per se is informed on issues facing the BMP phase coordinators through regular receipt of meeting minutes, by the first-hand knowledge of co-participation representatives, and by the presence of the associate dean for academic affairs and research.
- This structure also assures effective communication back to the Phase Coordinators Committee.
- *The Clinical Clerkship Coordinators Committee*: Details of overall policy and implementation of the third and fourth years of the undergraduate medical student curriculum are overseen by the Clinical Clerkship Coordinators Committee.
- Because the medical students have a choice of taking their clinical years in either Macon or Savannah, there are departmental clerkship coordinators for the clinical education program identified in both locations. This committee is composed of the two clerkship coordinators from each clinical discipline (psychiatry, pediatrics, obstetrics and gynecology, internal medicine, family medicine, and surgery), one representing the Macon campus and one representing the Savannah campus.
- The committee also has a representative from the Community Science Program.
- The associate dean for academic affairs and research serves ex officio on the committee and also chairs this committee.
- Also serving in an ex officio capacity is the associate dean for academic programs in Savannah and the chair of the CIC, or his or her designee. All of these latter individuals attend all CCCC and CIC meetings to assure communication between these two groups.
- The committee meets monthly via teleconference, at which time all issues generally affecting the operation of the third- and fourth-year curricula might be discussed.
- In matters of curricular policy the CCCC reports to the Curriculum and Instruction Committee.
- One of the major tasks facing the CCCC and its individual departmental members is to assure that the implementation of the third and fourth years of the academic program are comparable in Savannah and Macon.
- The content and implementation of each clinical clerkship are the responsibility of the chair of the clinical department, working in close communication with the respective clerkship coordinator(s).
- Beyond the overall policy issues dealt with by the CCCC, these individuals must stay in close communication on a departmental level regarding oversight of clerkship implementation between Macon and Savannah. Each discipline has an overall curriculum guide (available for review upon request) for its clerkship, which contains all program and policy information pertaining to each individual clerkship. The discipline curriculum guides are identical for the Savannah and Macon campuses.
- Each department clerkship is reviewed at least biannually by the CIC. At that review the departmental representatives describe the current content and policies of departmental program and provide copies of the program guidelines for review.
- As a result of the new affiliation agreement that separates the administrative leadership of the departments, future CIC reviews will require attendance of representatives from both Macon and Savannah.
- It is anticipated that the CIC will make periodic visits to Savannah and that a certain percentage of these clinical program reviews will be conducted in Savannah.
- The school of medicine faculty has created a highly integrated, interdisciplinary program with main education themes ranging throughout the four years of study. Consistent with the AAMC Medical School Objectives Project (MSOP), there is a track concerned primarily with the acquisition of knowledge.
- In the first two years a knowledge base in basic medical science is presented continually in a clinical case-based interdisciplinary manner. As the program merges into the

clinical years, emphasis on basic science knowledge is gradually replaced with an emphasis on clinical information. Likewise, development of clinical skills is begun the first week on campus with the Clinical Skills Program, which extends over the first two years, is supported practically by the COPP experience and practical training in the area of population-based medicine, and is expanded by the clinical experiences of the third and fourth years.

Office of Education

- MUSM does not have an office of medical education dedicated specifically to undergraduate studies. There is the Office of Medical Education, which focuses on continuing medical education and graduate medical education. A similar group in Savannah (the Department of Medical Education) provides centralized support and consultation to all medical education faculty.

Budget to Support Educational Programs

- The budgets follow the administrative hierarchy, which is division- and department-based.
- There are specific budgets for academic affairs, the library, learning resources, etc., but none of these is comprehensive for medical student education.

Valuing Teaching

- The dean's office sponsors a regular, ongoing program of education seminars over a variety of topics designed for enhancement of clinical and basic science faculty teaching skills. There are also occasional seminars and workshops on education strategies or methods.
- For the most part, however, development of faculty (and residents) as teachers occurs at the department level.
- Faculty are actively involved in planning and coordinating such activities for other faculty, residents, students, and professional colleagues.
- The faculty are highly productive researchers, authors, and presenters at local, regional, national, and international conferences.
- An annual faculty report lists specific professional development activities by individual faculty and department.
- Faculty are expected to be effective teachers and researchers, and a variety of programs are designed to enhance those skills.
- Some examples of faculty teaching activities include:
  - All faculty participated in a 16-week seminar on the book by Tom Peters entitled *The Circle of Innovation*.
  - A survey conducted to assess faculty development need documented educational needs in the areas of surgical ethics, financial management, and teaching the adult learner. During 1999, several seminars directed to faculty development in these areas were added to the Director's Conference.
  - Two surgical grand rounds sessions have also been devoted to these topics, with the first lecture on surgical ethics.
  - A professional was added in 1999 to assist faculty and residents with research projects, research and manuscript writing, and consultation.
  - The Graduate Medical Education Committee has instituted an approach to improving teaching skills whereby the associate dean for graduate and continuing medical education/director of medical education has scheduled two one-month blocks for each residency program. During that time he randomly attends grand rounds, morning reports, work rounds, etc., to observe teaching and communication skills. At the conclusion of each block, a feedback session is conducted with faculty, residents, and students.
- The Office of Medical Education in Macon is the centralized administrative unit for Continuing Medical Education (CME) and it is integrally involved in planning, conducting, and supporting ongoing as well as major CME activities.
- The Office of Medical Education includes a full-time media specialist who assists faculty and residents in developing presentation materials. During any academic year, most faculty will present CME activities, and residents are required to develop their formal presentation skills.
- The Annual Day of Surgery and the Annual Day of Medicine are noteworthy, as both require residents' presentations of scholarly work, which are carefully judged to determine awards.
- The Office of Medical Education administers the Clinical Research Center and works closely with the MedCen Foundation to stimulate and support basic science and clinical research. Currently, faculty and residents are involved in 23 grants through the Clinical Research Center and 29 MedCen grants. Plans have begun to sponsor a university-wide Day of Biomedical Research coordinated through the Office of Medical Education.
- The Department of Medical Education in Savannah provides central support and consultation to all faculty on a wide variety of medical education issues. These include

curriculum, instructional design, evaluation systems and procedures, leadership and management skills, dealing with learners in difficulty and designing remedial course work, clinical teaching in the ambulatory care setting, instructional software selection and design, research design, media and audiovisual technology, and computer-assisted education.

- The department provides resources for faculty to attend faculty development workshops and programs sponsored by other organizations, such as the "Surgeons as Educators" conference sponsored by the American College of Surgeons and the "Teaching and Learning Series" sponsored by the University of Southern California.
- Each member of the faculty is expected to develop a course of self-study and continuing medical education to maintain both clinical knowledge and teaching skills. Faculty are provided with two weeks and $6,000 annually to support their continuing education activities.
- Faculty awards are an important aspect of the faculty development program, both from the standpoint of recognizing excellent individual effort and as a standard for all faculty to strive to attain. Students select faculty and residents from each clinical department for recognition as the Teacher of the Year.
- Development of surgical and procedural skills is a key component of the medical school curriculum. The Department of Medical Education provides faculty with the opportunity to develop courses in surgical skills and to experiment with different techniques and approaches in the surgical dissection laboratory. Several courses using both cadaver and animal models are provided each year, along with individualized learning and practice sessions in the lab.
- The Medical Education Auditorium, located on the Savannah campus, is a technologically sophisticated learning facility, offering video, audio, computer-assisted, Internet, and distance-learning capabilities.
- Faculty are expected to develop competence in use of these technologies and are provided with the opportunity to do so with the assistance of the medical education media services department.
- The Department of Medical Education supports the development of faculty research skills through the Research Center, a central clearinghouse and support service for clinical research conducted at the institution.
- Plans for the upcoming year focus on two areas: the development of a monthly faculty development seminar or workshop focusing on current issues and problems in medical education using a journal club format, and the development of faculty skills for devising computer-assisted courses.
- A particular concern in both Macon and Savannah is the preparation of residents for their roles as teachers and evaluators of medical students. Programs are in place at both sites to increase attention to residents as teachers.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- MUSM has extensive outcome objectives developed for all of its programs.
- Over the past year the school has developed a redefined series of education objectives, mentioned below. (Individual phase or program goals are available from the author.)
- The primary educational objectives of MUSM are to educate primary care physicians for rural and other underserved areas of Georgia, and to instill in these students a commitment to lifelong learning.
- Admission criteria and curricular components are designed to foster this mission.
- Specific educational objectives are grouped into the broad areas of knowledge, skills, attitudes, and mission. (They are available from the author.)

Changes in Pedagogy

- MUSM is a relatively young medical school, admitting its first class in 1982. It took several years for the complete curriculum to be defined and then a limited time before it became "institutionalized." With only minor modifications, it has been a relatively stable program for the past ten years.
- The first two years of the program are dedicated primarily to basic science education. The school uses a problem-based pedagogy to deliver the education program in basic science and pathology.
- All students experience the case-based, student-centered, small-group discussion model throughout their first two years.
- Lecturing is kept to a minimum and only occasionally occurs in response to specific topics requested by students. Lectures are called "resource sessions."
- Small-group teaching is also emphasized for the community science, clinical skills, and bioethics portions of the program during the first two years.
- The third and fourth years of the program tend to reflect a fairly traditional educational pedagogy.

- With respect to training in dutifulness and altruism, the school has always had components that foster these behaviors throughout its program, not only in the introductory medical ethics program but also as a component of the ongoing clinical and BMP programs.
- Consistent with the overall academic approach, training in dutifulness and altruism will be present not as a series of courses in medical ethics, spirituality, medical legal issues, domestic violence, etc., but instead via interdisciplinary, case-based approach where learning issues are presented to students in a complex context that they will encounter in practice.
- The end product of this effort should make very visible the faculty commitment to training a complete physician, not only knowledgeable and skillful in medical science but also sensitive, compassionate, and caring to patients, colleagues, and the profession.

Application of Computer Technology

- Students are not required to own computers.
- The entire first two years of the curriculum are accessible via the Internet (password-protected), as are a substantial number of electronic reserves designed to supplement student learning.
- It is in the area of computer-based technology that the education program has grown most extensively in recent years and continues to do so.
- The faculty work closely with technology personnel to keep the system updated.
- In 1999 a modified "chat line" was developed for the BMP program, wherein students can ask questions on-line and receive their answers on-line. In this way the whole class and all tutors can have access to updated information.
- The library is responsible for keeping "copyrighted" materials on the system, whereas the information technology group deals with faculty-generated learning resources and all items of this sort. It is anticipated that this program will continue to grow in both breadth and depth.

It should also be noted that this medium is an excellent source for visual learning.

Curriculum Review Process

- The Curriculum Committee reviews the entire academic program once every two years.
- Each Curriculum Committee meeting has some aspect of the program up for internal review. Also, the Curriculum Committee travels to Savannah at least once annually. While there, they review three of the six mandatory clerkships in a given visit. They also review fourth-year electives and "required electives" on a regular basis.
- In the past couple of years there has been an effort to present more education seminars and education-centered retreats, but they have been oriented toward expanding faculty teaching skills in small-group process rather than toward changing curriculum.
- Because of the nature of the program at MUSM, especially in the first two years, an interdisciplinary group of physicians and basic scientists must review and update each phase of the curriculum annually.

Future Goals

- It is anticipated that there will be continued development of the bioethics and professionalism curricula.
- There is a blueprint of how an experiential program in this area will be developed that will permeate all four years of the curriculum, culminating with a "capstone" experience in the fourth year just before graduation.
- This bioethics effort will be an add-on to a number of programs, especially those programs where there are heavy interactions with patients. Emphasis will be on experiences that are experiential in nature rather than activities aimed at accumulating knowledge. Attempts will be made to raise the consciousness of students toward the value-laden aspects of the medical profession.

Morehouse School of Medicine

MARTHA ELKS, MD, PHD

Curriculum Management and Governance Structure

- Medical education at Morehouse School of Medicine is department-based and traditionally structured.
- Oversight and review of the curriculum are performed by the Curriculum and Evaluation Committee, which reports to the Academic Policy Committee (of chairs and faculty representatives, led by the dean).
- In 1998, the position of associate dean for educational affairs was created and filled.
- The responsibilities of the associate dean include undergraduate medical education, graduate medical education, CME, and faculty development.

Office of Education

- The Department of Medical Education was established in the early 1990s.
- This department performs and coordinates course evaluation, supports the Curriculum and Evaluation Committee, and provides a departmental home for interdisciplinary courses.

Budget to Support Educational Programs

- There is no distinct budget for medical student education.
- There is an ongoing and current effort to define and fund explicitly the costs of courses and student education, as well as an effort to move to mission-based budgeting.

Valuing Teaching

- The Department of Family Medicine has a well-established, ongoing, and funded program of faculty development. Over 50% of the faculty of MSM have participated in this program and/or workshops and other educational programs.
- There is a new funded faculty development program in general internal medicine focused on scholarly activity and career development as well as teaching skills.
- These faculty development programs address teaching skills in different settings; curricular development; processes of evaluation; writing skills; research skills; and grant-writing activities.
- For the coming year, selected faculty will have more defined roles with funded time to engage in educational planning, development, and review.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In 1997, a set of overall objectives for the medical student education program was developed. These were revised and approved in 1998. (A copy of the objectives is available from the author.)

Changes in Pedagogy

- The curriculum has a traditional discipline-based structure.
- In the late 1990s, histology, embryology (cell biology), and gross anatomy were integrated into a course titled Human Morphology.
- A course in pathophysiology has been developed and is taught in an interactive case-based format.
- Interactive problem-solving activities are used to teach selected sections of pharmacology.
- There is a current examination of the overall curriculum and new efforts in most first- and second-year courses to integrate more interactive, small-group, and problem-solving sessions.

Application of Computer Technology

- Students are not currently required to own computers.
- Computer access is required for some elements of some courses.

- On the basic sciences campus, there are about 30 computers in the multimedia center, ten computers in the multidisciplinary laboratories, and three electronic classrooms with ten to 15 computers each, so there is ample computer access for the classes of 40 students.
- Course materials are being mounted on Web sites and the school is moving toward computer-based assignments and testing in selected courses.

Curriculum Review Process

- Through the Curriculum and Evaluation Committee, there is an ongoing evaluation of the courses (every three years using a prescribed format).
- The school is at the start of a curricular renewal initiative that is focused on quality of instruction and integration of clinical materials in preclinical courses as well as preclinical materials in clinical courses. This has started with individual course review and year-by-year review.
- Interdisciplinary teams are being developed to have ongoing roles in education and course development.
- The major barriers are funding for faculty time and support personnel and conflicts between practice needs and teaching-time needs.

University of Hawaii John A. Burns School of Medicine

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Curriculum Management and Governance Structure

- In 1989, the University of Hawaii John A. Burns School of Medicine adopted the McMaster University problem-based learning (PBL) format.
- In the first two years, lecture-based, discipline-specific courses (e.g., biochemistry, microbiology, physiology) were replaced by student-centered, tutorial-based learning.
- Students analyze 83 paper cases ("health care problems") that are organized into five longitudinal curricular units. Each unit is coordinated by a clinician–basic scientist co-chair team.
- An interdisciplinary MD Program Committee consisting of unit co-chairs and others critical to the administration of the curriculum assumed central governance of the curriculum. This committee replaced the traditional curriculum committee that had been built along disciplinary lines and consisted of departmental representatives.
- The third-year clerkships are governed by the Unit 6 (clinical clerkships) Committee, with the two members of this committee also having seats on the MD Program Committee.
- The fourth-year (Unit 7) curriculum is governed by a multidisciplinary committee and represented by a seat on the MD Program Committee.
- While the traditional third-year clinical clerkship rotations and fourth-year clinical electives have remained essentially unchanged, an interdisciplinary, ambulatory-based, longitudinal third-year clerkship option has been added (see below).
- The governance and management of this longitudinal program are through the Office of Medical Education in conjunction with the Unit 6 Committee.

Office of Education

- The Office of Medical Education was established in 1989.
- Initially, the office received intramural funding and an operating budget, primarily for implementing and managing the PBL curriculum and community medicine initiatives in years one and two.
- The office grew to include four extramurally funded professional educators whose responsibilities were to develop, implement, and evaluate the PBL curriculum and related curricular innovations.
- In the mid-1990s, extramural funding declined and these professional educators were replaced by intramurally funded, part-time appointments (2.25 full-time faculty equivalents total) of faculty from basic science and clinical departments.

Budget to Support Educational Programs

- Perhaps as much as 10% of the budget for medical education goes directly to the Office of Medical Education.
- The majority of the funds are still managed by the basic science and clinical department chairs.

Valuing Teaching

- In the mid-1990s, the dean's office recognized the need to develop a medical education track that would allow for promotion and tenure of faculty dedicated to medical education.
- The medical education track provided that faculty who contributed to the ongoing development of the problem-based learning curriculum (e.g., unit chairs, chairs of standing committees, etc.) would be recognized and considered for promotion and tenure. In practice, few faculty have been promoted via this mechanism.
- Currently, most faculty in the Office of Medical Education hold part-time appointments in basic science or clinical departments and are promoted through these departments.
- The future success of the promotion track will depend upon the collaborative mentoring and development of junior faculty by the director of medical education and respective department chairs.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The first two years of the curriculum have been divided into five interdisciplinary, organ-system–based curricular units. Each of these units identifies general student competencies against which students are evaluated.
- The outcomes are determined and overseen by the MD Program Committee and respective unit chairs in collaboration with discipline experts.
- Periodically, the unit chairs and discipline experts review expected outcomes.
- Curricular changes are reviewed by the Unit Chairs Committee and major changes approved by the MD Program Committee.

Changes in Pedagogy

- A patient-centered, student-directed, community-integrated, problem-based learning (PBL) curriculum has been adopted in the first two years of the curriculum.
- Learning is self-directed and centered on clinical cases.
- Knowledge is acquired actively by discussions in small-group tutorial sessions. Many of these tutorial sessions occur in the community at various clinical sites.
- Supplemental lectures and laboratory experiences are integrated with the cases and unit themes.
- The learning experiences are further enhanced with weekly clinical skills and community medicine experiences throughout the first two years of the curriculum.
- Standardized patients are used extensively for both learning and evaluation of communication skills and clinical skills.
- While the third-year clerkships remain patient-care–based, much of the small-group teaching and learning in these clerkships is done in a PBL fashion.
- Time for independent problem-based learning is explicitly built in to the students' schedules in the clerkships.
- Students have the opportunity to work with standardized patients throughout their first two years of training. Some of these patients portray the characters from the students' PBL cases, providing students with a chance to interact directly with the patients they are studying. Other standardized patients give students the opportunity to practice a broader range of skills (smoking cessation counseling, obtaining a sexual history, etc.).

Application of Computer Technology

- Students are not required to own computers, but all but one student in the most recent entering class stated that they owned computers and used the Internet regularly.
- As much of the curriculum relies on student self-directed learning, computer technology plays a central role in our educational program.
- A learning resource center offers students 24-hour access to Internet-accessible computers, printers, scanners, and learning software.
- Every student is provided with an e-mail account.
- Each unit in the curriculum has a Web site that provides students with message boards, electronic announcements, and additional unit-relevant learning resources.
- Image-rich internal Web sites exist for student study of pathology and anatomy laboratories. In addition to delivering laboratory and case-specific content, the Web site allows bidirectional communication between course administration, faculty, and students.
- Digital projectors that allow students to deliver computerized presentations during their tutorials are available.
- Additional distance learning capabilities are currently being developed.

Changes in Assessment

- With the implementation of the PBL curriculum, discipline or course-specific examinations have been replaced by interdisciplinary organ-system–based content and PBL process-focused assessment.
- In the preclinical years, each unit uses the following student evaluation tools:
  - At the end of each unit, students must successfully challenge a multidisciplinary modified essay question (MEQ) examination.
  - Questions from various basic science, clinical science, behavioral, and population perspectives are organized around short patient scenarios related to the cases studied in the unit.
  - A hands-on laboratory examination is also administered at the end of each unit.
  - Problem-based learning–skill examinations are administered one-on-one by faculty (the triple-jump examination) in three of the five units.
  - Objective structured clinical examinations (OSCEs) are used at various points along the four-year curriculum to assess clinical skills and communication skills.
  - Faculty complete rating scales of habitual performance for tutorial performance, clinical skills performance, and community medicine performance.

  - Written and oral peer evaluation from tutorial group members are also provided for formative feedback.
- In the clinical years, students must successfully pass written and/or oral discipline-specific examinations at the end of each clerkship.
- One clerkship also requires successfully passing an OSCE at the end of the clerkship.
- Students are evaluated by supervising faculty using rating scales of habitual performance.

Clinical Experiences

- In the first and second years of the curriculum, students spend approximately one half-day per week interacting with patients under the supervision of community-based faculty. These sessions may occur in hospital wards, community clinics, or private offices.
- In the third-year clerkships, students rotate through an 11-week clerkship in internal medicine, and seven-week clerkships in family practice, obstetrics–gynecology, pediatrics, psychiatry, and surgery.
- Students may be assigned to one of four community hospitals for the inpatient portions of these clerkships, and one of a number of community clinics or private offices for the outpatient portions of these experiences.
- Students may select the longitudinal clerkship series in which they spend six months in concurrent longitudinal outpatient clinics and six months in discipline-specific "mini-clerkships." The outpatient portion of this experience may be on one of the other islands in the Hawaiian Island chain.
- In the fourth year, students have a four-week required emergency medicine rotation.
- Most of the remainder of the fourth year is spent in various clinical electives, both locally and in other parts of the country.
- Throughout the four-year experience, there is increasing emphasis on training students in medically underserved areas and on providing them with meaningful exposures to diverse physician–educator role models.

Curriculum Review Process

- Curriculum review is done on an ongoing basis.
- Each year, the PBL health care problems are reviewed and updated by the respective unit chairs and discipline experts.
- Unit chairs work with the MD Program Committee to identify and develop additional content and skill areas in the preclinical curriculum (e.g., complementary and alternative medicine).
- Currently, efforts are under way to better standardize the curricular review process.
- In the clinical years, clerkship directors and department chairs are responsible for the curricular experiences in their disciplines.
- Each department has the equivalent of a curriculum committee to manage its educational experiences.
- With the transition to PBL in 1989, the medical school contracted with an outside organization to assess outcomes related to the new curriculum. This formal relationship has ended, leaving the medical school to develop internal mechanisms for curricular review.
- In the preclinical years curricular review is primarily led by the unit chairs and the MD Program Committee.
- Examples of current content areas being developed and expanded include complementary and alternative medicine, genetics and molecular medicine, medical ethics, end-of-life care, and communication in medicine.
- As the process of learning is as important as the content of learning, the MD Program Committee and Office of Medical Education are constantly reviewing and assessing the PBL and teaching skills of our students and faculty.
- Workshops for both students and faculty are offered regularly and emphasize areas of need identified by students, faculty, and curriculum administration.

University of Chicago Pritzker School of Medicine

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Curriculum Management and Governance Structure

- The dean of the Biological Sciences Division (BSD) and the Pritzker School of Medicine is responsible for the educational program in the medical school.
- Department chairs are responsible for medical school courses and clerkships in their disciplines.
- The department chairs appoint course directors and clerkship directors, who recruit and coordinate teaching faculty to develop and implement the curriculum for each course and clerkship.
- Until 1996, the Curriculum Review Committee (CRC), the members of which represented the departments responsible for the preclerkship basic science courses, reviewed courses and made recommendations to the course directors and departmental chairs for renewal of the preclerkship curriculum.
- At the same time, a more consistent and formalized course review process was developed under the guidance of the director of the Center for Research in Medical Education (CRME) in the Department of Medicine.

Since that time, several changes have been made to improve the management of the educational program.

- In October 1994, the Task Force on Review and Revision of the Medical School Curriculum began 18 months of work, which generated 14 recommendations for curricular renewal.
- In January 1996, the dean appointed a dean of medical education, creating an Office of Medical Education (OME), which included an associate dean of medical education and two other specialists in medical education.
- In June 1996, the former CRC was reorganized into a preclerkship CRC (PCRC) consisting of the preclerkship course directors and a new clinical biennium CRC (CCRC) consisting of the clerkship directors; other members included 12 elected medical students and the dean of students. These two groups shifted their focus from course and clerkship evaluations to discussions of educational issues influencing the medical school education programs.
- A third group, the Curriculum Steering Committee (CSC), made up of key members of the PCRC, the CCRC, and other key educators and administrators familiar with the vertical integration of the four-year curriculum, was created to oversee the entire curriculum.
- These three committees advise the OME, which is empowered to bring educational policy changes to department chairs and the dean, BSD, for ratification.

Office of Medical Education

- The OME at the school provides an environment where medical faculty, professional medical educators, medical students, and project professionals work together to create, manage, and foster a dynamic, competency-based curriculum in the art and science of medicine.
- Under the leadership of the dean of medical education and the associate dean of medical education, the OME unites under a single working structure the OME and the CRME.
- The OME boasts a strong staff of faculty and professionals in medical education, curriculum and instruction, testing and individual program evaluation, business administration, media design, and Web-based production.
- The charge of the OME is to be responsible and accountable for the structure of a coherent and coordinated medical school curriculum; to organize, facilitate, and evaluate faculty teaching in the curriculum; and to work with faculty to improve the methods used to evaluate the performances of our medical students.
- Enhancement of the OME since 1996 has included a substantial budget increase that has permitted
    - coordinating the curriculum review and renewal process
    - funding special initiatives and new integrative courses
    - compensating faculty for developing new courses and revising existing ones
    - providing services of education specialists to assist in curriculum development, course evaluation, and student assessment
    - implementing a program to facilitate faculty teaching excellence and career progression
    - establishing a Clinical Performance Center for using standardized patients in medical education and evaluation

  - establishing a computer learning center for medical students

Budget to Support Educational Programs

- The OME budget provides for a dean and an associate dean of medical education, an administrative director, two education specialists, a data manager, and two administrative assistants.
- Included in the budget are annual budget lines for faculty teaching awards (FTAs), course/clerkship development grants (CDGs), and examination development, the latter being used in large part to refurbish space and equip and staff a new Clinical Performance Center.
- The FTA provides a monetary award to faculty who submit and implement proposals for course development or reorganization; this scholarship is meant to liberate a portion of the faculty member's time during the first two or three years of implementing the curricular innovation.
- The CDG is an operating grant meant to equip the implementation of the proposal with clerical support, new teaching aids, copying charges, or other operating expenses.
- Each FTA or CDG is partnered equally with the department responsible for the course being revised or developed, to ensure continuity of support from that department at the termination of the award.

Valuing Teaching

- The OME implemented a recommendation from the task force to develop a program that identifies, rewards, and facilitates teaching excellence. The objective of this program was to promote institutional awareness of the added value of outstanding teaching and curriculum development. The key elements of this program are
  - implementation of the FTA/CDG program
  - support for selected faculty to attend teaching workshops sponsored by other institutions to enhance their own teaching, as well as to establish teaching workshops for faculty at our own school
  - development of a faculty teaching portfolio documenting the full array of faculty teaching contributions, for use by our Committee on Appointments and Promotions
  - invitations to awardees and other prominent teaching faculty to join a new Society of Medical Educators, which meets quarterly to discuss selected topics of medical education
  - developing and presenting workshops designed to enhance faculty's and residents' skills in teaching and evaluating medical students
  - providing letters of acknowledgment to the faculty and housestaff who receive teaching awards, with copies to their department chairs, the dean, and the provost
- The OME maintains the teaching schedules for all courses and clerkships in the medical curriculum and maintains the list of faculty who teach in the formal curriculum.
- At the end of each quarter, students are asked to rate all the courses, clerkships, and the faculty teaching in them. The OME uses these data, along with information acquired in meetings with curriculum committees on individual faculty, to identify perceived needs of the teaching faculty as well as courses and clerkships where additions, improvements, or revisions are needed.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In an effort to make explicit the mission of our educational program by defining the competencies we expect of our graduates, the student objectives committee developed the following statement of the goal and competencies, which was then distributed among department chairs and their faculty, educational leaders, and medical students. Several modifications have been made during annual review of this statement, and the most recent articulation follows.
- The goal of the University of Chicago Pritzker School of Medicine is to graduate accomplished physicians who are capable of functioning as outstanding clinicians, physician–scientists, medical educators, and clinical scholars. As a measure of their professional competence, Pritzker graduates will:
  - Scientific basis of medicine
    —Demonstrate a thorough understanding of the basic sciences and their application to the practice of medicine and to medical research
    —Possess an in-depth understanding of how new knowledge is created in the clinic or at the laboratory bench through active participation in research and independent study
  - Patient care
    —Exhibit a high level of clinical proficiency in history taking, physical examination, differential diagnosis, and the effective use of medicine's

  evolving diagnostic capabilities and therapeutic modalities
  - —Apply to clinical care an understanding of the impacts of psychological, social, and economic factors on human health and disease
- Communication
  - —Possess the effective teaching skills necessary to educate both physicians and non-physicians
  - —Demonstrate excellent interpersonal communication skills
- Professionalism
  - —Assume leadership roles as outstanding investigators, educators, and/or clinicians
  - —Be expert at acquiring and applying new knowledge to clinical practice and research
  - —Exhibit exemplary professionalism in all actions and interactions
  - —Apply knowledge and training in one or more interdisciplinary fields to a career in medicine

Changes in Pedagogy

- Small-group teaching is now used in 12/20 preclerkship courses and in all clerkships.
- Clinical case studies are increasingly used in preclerkship courses to introduce concepts to students, as well as to test students' understanding on midterm and final exams.
- There is a newly developed Clinical Performance Center where standardized patients (SPs) are used during the clinical skills course to teach and evaluate basic (years one and two) and advanced (year four) interviewing and physical diagnosis.
- Self-assessment of experiences is being built into the curriculum, along with more opportunities for structured self-directed learning.
- Thematic interdisciplinary teaching of related courses is being implemented horizontally in each preclerkship years (structure–function, cell defense, clinical pathophysiology pharmacology), and vertical integration groups are developed across all four years (humanism, gender issues, cultural diversity, sleep and its disorders).

Application of Computer Technology

- While medical students are not required to have their own computers, they have access to computers in the Biological Sciences Learning Center, the Crerar Health Sciences Library, and the University Hospitals.
- At orientation to medical school, students are provided with an e-mail address and instructions for its use.
- A newly established Computer Learning Center for medical students provides a facility for computerized testing, as well as serving as a computer classroom for computer-assisted learning and general computer use.
- As part of a comprehensive e–curriculum program, students have access to course and clerkship information via the Web.
- Each course and clerkship has its own Web site containing information in such areas as course objectives, schedules, readings, links to on-line textbooks and journals, and special instructional technology modules.
- Several preclerkship courses provide extensive use of instructional technology, including human morphology, clinical pathophysiology, and neurobiology.
- In their orientation to the clerkship years, students are trained to use OACIS, our computerized patient record system, including policies of confidentiality and the ethical use of patient medical data.
- During the third-year medicine clerkship, students are introduced to medical informatics and are taught to do literature searches as part of an evidence-based medicine exercise and to use PowerPoint as a presentation tool.
- Students are represented on the Dean's Committee on Academic Computing in the Medical School, which consists of faculty, information services personnel, and students whose role is to inform the dean about ways to integrate instructional technology into the medical school curriculum.

Changes in Assessment

- Beginning in the Clinical Skills course in the first and second years of medical school, standardized patients are used to assess students' skills in interviewing, asking difficult questions (about domestic violence and mental status), and in conducting the head-to-toe physical examination.
- In each of the required clerkships, specific clinical performance objectives have been developed as the measure by which faculty observe and assess medical students' clinical skills.
- Using the CPC, an end-of-clerkship, multi-station standardized patient examination for the 1999–2000 third-year class will use a format similar to that proposed by the National Board of Medical Examiners (NBME) for the Step 2b USMLE.
- Using the Computer Learning Center paper-and-pencil subject examinations are administered in six of the required clerkships, and plans are to administer these

examinations via computer when the NBME makes this means of administration available to the school.

- As a further means of improving the clinical assessment of medical students, junior faculty and residents have been provided with increased instruction on assessing medical students' performances and giving feedback.

Clinical Experiences

- All students spend time learning generalist principles in physicians' offices in all eight required clerkships: family medicine (one month), internal medicine (one month), pediatrics (one month), surgery (two weeks), psychiatry (two weeks), obstetrics–gynecology (two weeks), neurology (one week), perioperative medicine and pain management (one week).
- All students spend time in the clinics and wards during seven required clerkships: medicine (two months), surgery (two months), obstetrics–gynecology (one month), pediatrics (one month), psychiatry (one month), neurology (two weeks), perioperative medicine and pain management (two weeks).
- Other required clinical experiences in the senior year include subinternships in students' specialties of residency (four weeks) as well as a return to the scientific basis of medicine, a four-week required selective from an array of courses designed to return understanding of basic science to the clinical biennium.
- Senior students enhance their clinical experiences by choosing up to eight options from an array of electives offered in ambulatory and in patient settings.

Curriculum Review Process

- A Task Force on Review and Revision of the Medical School Curriculum was appointed in the autumn of 1994 and met on 20 occasions until the spring quarter of 1996.
- The task force consisted of 24 faculty, housestaff, and students selected for their interest in the education of medical students, and supplemented by about 50 additional faculty, housestaff, and medical students providing additional input to ten subcommittees and working groups.
- The major curricular revisions began to be implemented during the 1996–97 academic year, and most were put in place for the 1997–98 academic year.
- In recognition of the changing face of health care and medical education, several factors made this review particularly timely.
    - An increasing obligation to put a larger emphasis on the generalist practice of medicine in ambulatory settings
    - Revolutionary changes in the application of laboratory advances to bedside medicine required a re-examination of the relationships between basic science and the clinical elements of our curriculum
    - The need to empower curricular management to implement recommendations for renewal arising from review of our current curriculum
- The task force recommendations built on the current strengths of the school's curriculum in helping graduates to acquire understanding of the scientific basis of medicine and medical reasoning and to pursue life-long learning.
- The consequent shift in clinical teaching from one of established strength in the inpatient teaching of subspecialty medicine toward the ambulatory teaching of generalist principles was a change large enough to warrant ongoing evaluation, and the development of enhanced techniques for evaluation of student performance, faculty teaching, and learning programs confers significant new strengths to our medical school curriculum.
- The permanent mechanisms for ongoing review and revision of the medical school curriculum are now in place, and there is enthusiasm among faculty, housestaff, and students for the process of medical education renewal.
- To promote consensus and help implement these recommendations, the dean used interim reports of the task force as a basis for a series of mini-retreats in the autumn of 1995 addressing medical education as an essential component of priority setting for an integrated enterprise in the Biological Sciences Division and the University of Chicago Hospitals.
- The dean used selected components of the final report of the Task Force as a basis for a retreat on education reform for 80 leaders of the Biological Sciences Division in June 1996.
- Topics addressed at the retreat were: Educating Physicians for the 21st Century—Is the educational mission of the Division sufficiently broad to meet graduation objectives for medical students?; Identifying, Rewarding, and Facilitating Teaching Excellence; and Information Technology and its Reform of Medicine—Establishing a curriculum of competence for 21st century physicians.
- The dean established a Dean's Education Group including divisional leaders in medical education, which provided a forum for discussion and implementation of task force recommendations.

- In summer 1999, the dean convened a second series of mini-retreats on medical education designed to evaluate the current programs and to set the goals for the future.
- A curriculum inventory, compatible with Curr-MIT, has been posted on the OME Web site (http://ome.bsd.uchicago.edu). The inventory, based on Steps 1 and 2 of the USMLE content outline, provides a computerized link between curricular topics and the courses and clerkships in which the topics are covered. This inventory is used as a resource by faculty, students, and curriculum administrators to ensure that important curricular topics are included in the medical school curriculum.

  Summary of curricular revision:
  - Established an Office of Medical Education (OME) including an infrastructure sufficient to implement recommendations of this task force, with a strong interaction with the Center for Research in Medical Education.
  - Appointed a Curriculum Steering Committee to continue review and revision of the curriculum and establish regular meetings of the clerkship and course coordinators.
  - Established a family medicine clerkship for all junior students using the teaching resources at MacNeal Hospital, informed by a MacNeal/University of Chicago Curriculum Committee to help develop and implement teaching and evaluation methods.
  - Changed the junior year from the quarterly system to a monthly system, to create opportunities for ambulatory rotations in family medicine, internal medicine, pediatrics, and surgery and to improve the continuity of clerkship teaching and evaluation.
  - Reorganized the entirely elective senior year to include required participation of all students in important learning opportunities selected from an array in sub-internships, and the scientific basis of medical practice.
  - Improved the preclerkship curriculum by reorganizing courses identified as problematic by the students and the task force subcommittee on Teaching Basic Science in the Medical Curriculum.
  - Documented and increased the use of computers in medical education and introduce medical informatics into the curriculum.
  - Improved the evaluation of medical students.
  - Improved institutional methods for identifying, rewarding, and facilitating teaching excellence.
  - Developed a description of the Pritzker graduate in terms of expected competencies.
  - Implemented a curriculum addressing women's and children's health issues.
  - Developed a program for the enhancement of resident teaching of medical students.
- The OME coordinated the formal process for review of its educational program by three curriculum committees.
  - The Curriculum Steering Committee (CSC) is responsible for overseeing the entire curriculum. This committee is watchful of the horizontal and vertical integration of the curriculum and the transitions in student preparation from college to medical school and from medical school to postgraduate training. The CSC is responsible for evaluating effects of curricular change, being alert to redundancies and gaps in the curriculum, and the visionary planning of a coherent and coordinated curriculum.
  - The Pre-Clinical Curriculum Review Committee is made up of student representatives and course directors for courses taught during the first two years of the four-year curriculum. This committee focuses on individual course reviews and has an increased awareness of material being covered in concurrent courses. To facilitate problem identification and implementation of solutions, membership on the Curriculum Review Committee was expanded to include all preclinical course coordinators and faculty members responsible for developing new courses along with three student representatives from each medical school year. Most of the 40 members meet on the second Monday of each month.
  - The Clinical Curriculum Review Committee consists of the same 12 student representatives together with course directors for the clinical clerkships and clinical electives. Members of the former CRC with predominant interests in clinical education were invited to join the new CCRC. This committee of 36 members meets on the fourth Monday of each month, as a review body to implement changes proposed by the task force, and to evaluate the clinical clerkships and electives in the clinical biennium.

Future Goals and Challenges

- Curriculum
  - Curricular renewal should be continually advanced to ensure vertical integration, block teaching, teaching clinical relevance, and lifelong learning skills, and thematic interdisciplinary teaching.
  - Basic science coordinators should review the curriculum inventory to ensure those areas are covered in their teaching. Pritzker should provide opportunities to familiarize students with similar exam formats, using the new computer learning center.

- Clinical skills
    - Consider expanding the use of the CPC to include post-clerkship evaluations and measuring residency competencies.
- Informatics
    - Develop a visionary plan for funding academic computing and medical informatics
    - Extend Crerar Library's electronic course reserve support to the medical school (lecture notes, symposia, etc.).
    - Consider a pilot program aimed at increasing faculty's computer literacy.
- Teaching
    - Continue faculty teaching awards and course/clerkship development grants.
    - Establish a faculty committee to advise the dean of ways to document qualifications for promotion in the clinician educator track.
    - Chairs and section chiefs are expected to review with faculty their teaching evaluations and work with them to develop improvement plans.

University of Illinois College of Medicine at Chicago, Rockford, Peoria, and Urbana–Champaign

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Curriculum Management and Governance Structure

- The UIC College of Medicine has four educational sites throughout the state of Illinois. Two of the sites, Chicago and Urbana–Champaign, are located at large university campuses; Peoria and Rockford are community-based schools and clinical centers. Each site has its distinctive features and special programs. All sites are governed by the same policies, with uniform standards and expectations. There is a single admission committee. Site assignment is made in accordance with student wishes insofar as possible, while maintaining a stable cohort at each site. Students assigned to Rockford and Peoria complete their first year at Urbana–Champaign.
- The following structure has been in place since 1982, when the University of Illinois' Board of Trustees reaffirmed its commitment to the regional educational sites.
    - The responsibility for the central administration of all educational efforts of the COM including UGME, GME, and CME now resides with the senior associate dean for educational affairs.
    - Recent changes in the responsibilities of the Education Coordinating Committees (ECCs) (formerly Joint Conference Councils) have refocused their concerns to educational issues relating to instruction and appraisal.
    - The ECCs are the discipline-based working groups that are ultimately responsible for integrating the UIC-COM Graduation Competencies into the medical curriculum.
    - The College Committee on Instruction and Appraisal (CCIA) monitors the effectiveness of the curricular and appraisal experiences and instruments, creates opportunities for collaboration and coordination among sites, and provides interdisciplinary connections across specialties.
    - The College Committee on Student Promotions (CCSP) reviews and recommends policy concerning student progress, dismissal, or graduation and takes action on proposals from the site promotions committees to promote, dismiss, approve for graduation, and designate students who have distinguished themselves regarding academic honors.
    - A diagram of the management and governance structure is shown in Figure 1.

Office of Education

- The COM has a Department of Medical Education (DME) located at Chicago.
- The department celebrated its 40th anniversary in 1999.
- The DME is available as a resource to all educational sites, but the day-to-day operations are facilitated by educators/administrators at each site.

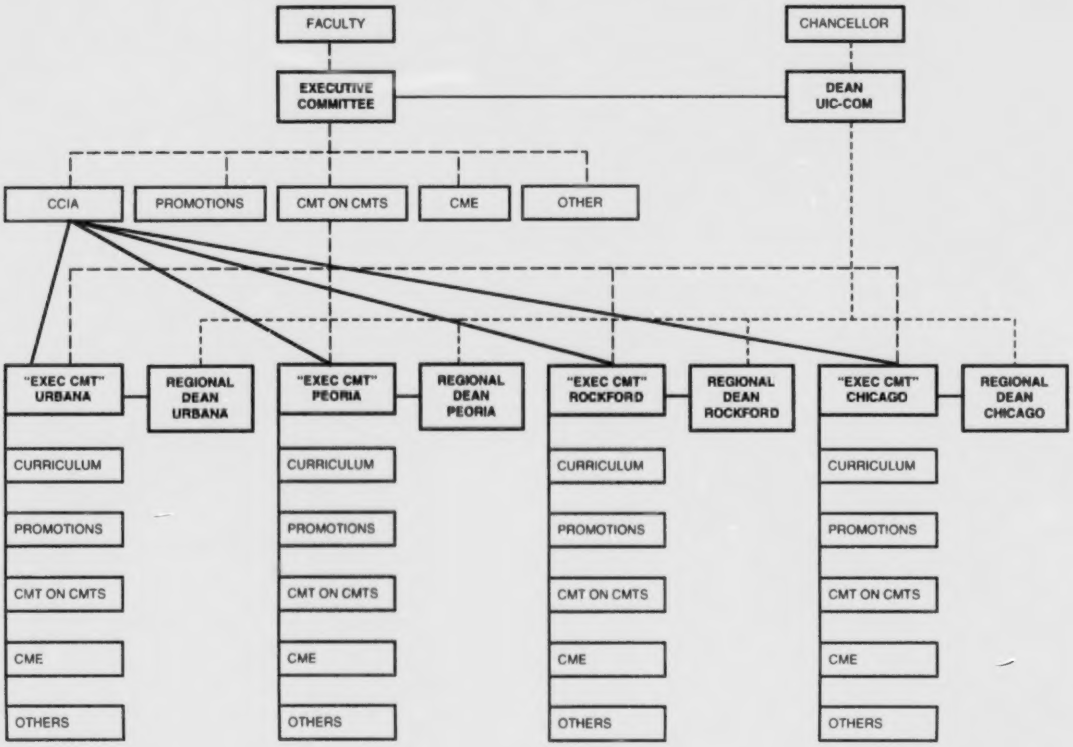
Budget to Support Educational Programs

- The dean or regional deans distribute money to each department.
- It is the responsibility of each department head to provide adequate support for the educational program.

Valuing Teaching

- The College Executive Committee recognized that the evaluation of the teaching process and recognition of its contribution to promotion and tenure were critical issues for UIC in 1992.
- A College Committee on Teaching was formed and over a three-year period developed a system to document teaching that is equivalent to the documentation of research for promotion and tenure purposes.
- Whereas the former system primarily considered faculty contributions to and recognition for research and scholarly activity, the new system includes teaching as an equally significant function for academic promotion.
- Criteria and direction are now available about how to collect and submit data for teaching activities, and the COM's general approach to recognizing excellent teachers has been published.
- Various teaching awards are available from the university

FIGURE 1: Management and Governance Structure


FACULTY
CHANCELLOR
EXECUTIVE COMMITTEE
DEAN UIC-COM
CCIA
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OTHER
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CURRICULUM
PROMOTIONS
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OTHERS

and from UIC-COM to encourage and recognize excellence in teaching, several of which include salary increases.

- An Academy for Excellence in Teaching has been established in Chicago, with quarterly meetings that include faculty development opportunities for all faculty.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In 1996, UIC-COM's CCIA set as one of its top priorities the establishment of graduation competencies. The CCIA met over a period of three years to identify and define what have become its graduation competencies. The Competency-Based Curriculum Department of the Brown University School of Medicine and the AAMC MSOP effort became the foundation for our graduation competencies. These are:

- Basic and clinical science knowledge base
  —The faculty of the College of Medicine at the University of Illinois believes that any statement of graduation competencies must include mastery of the body of knowledge that constitutes the basic and clinical sciences underpinning the practice of medicine. First and foremost, the graduate must possess a thorough understanding of the scientific principles of basic and clinical sciences that will enable him or her to competently practice evidence-based medicine.
- Communications/biopsychosocial issues
  —The competent graduate listens attentively and communicates clearly with colleagues, consultants, patients, and patients' families in a verbal and written manner so that accurate information is passed from person to person in order to establish an effective therapeutic relationship that contributes to coordinated, comprehensive care. This will ultimately result in effective, sensitive patient care.
- Ethical reasoning and judgment
  —The competent graduate approaches medicine with integrity and respect for human dignity, deals hon-

  estly with patients and members of the health care team, and seeks to promote these virtues in colleagues.
  - —The competent graduate recognizes key ethical dilemmas and conflicts of interest in medical practice and can formulate, defend, and carry out a course of action that takes into account the value systems of all patients, while maintaining personal integrity.
  - —The graduate applies key legal concepts and is aware of professional requirements governing medical practice.
- Lifelong learning
  - —The competent graduate actively sets clear learning goals, pursues them, and continuously integrates knowledge gained and applies it in order to improve medical care.
  - —The competent graduate is able to assess his or her strengths and weaknesses in order to improve performance and identify effective ways to address limitations, including seeking help and advice.
  - —The graduate can access information effectively, critically appraise the usefulness of this information, and utilize new technologies and scientific advances that are required for the continued enhancement of his or her medical practice.
- Data gathering/problem definition
  - —The competent graduate must be able to gather a medical history appropriate to the patient's medical concerns, perform a skillful examination, and formulate a differential diagnosis and problem list. As necessary, the graduate competently performs, orders, and interprets diagnostic investigations that result in accurate diagnoses and treatments.
  - —The competent graduate continues to utilize data to reason and solve problems and to retrieve information from many sources, including family and consultants, as well as electronic databases.
- Management/clinical decision making
  - —The competent graduate must be able to manage the patient by combining knowledge of basic biomedical and clinical sciences with diagnostic and therapeutic techniques, medications, and use of health care resources, while considering cultural and socioeconomic factors as well as the patient's personality to help the patient attain and sustain an optimal health state.
  - —The competent graduate appropriately utilizes and integrates the services of multidisciplinary health providers.
- Health maintenance/disease prevention
  - —The competent graduate knows the determinants of poor health, disease-based risk factors, factors for disease prevention and healthy lifestyles (principles of preventive medicine), and the elements of health education and applies the principles of epidemiology and evidence-based medicine to evaluating risk factors and management strategies.
  - —The competent graduate teaches patients and their families in order to prevent health problems and achieve the optimum standards of health care and disease prevention.
  - —The graduate is able to evaluate community resources and integrate them into the health maintenance of individual patients and their families.
- Social and community contexts of health care
  - —The competent graduate understands and is sensitive to the influence of culture on health, taking into account the spiritual, ethnic, socioeconomic, psychological, familial, legal, and political factors that impact patients. He or she is able to define health in terms of the community in which the patient lives (population-based medicine). The graduate can assess the effect of the physical environment on community health.
  - —The graduate is nonjudgmental toward individual patients and provides care regardless of personal feelings about the patient.
  - —The graduate understands the principles of health care delivery and can describe the organization of a health care delivery system in those terms.
  - —The graduate can describe the principles, risks, and possible benefits of complementary medicine.
- Professional behavior (personal, family, community)
  - —The competent graduate provides leadership in patient care, while respecting the views and interests of all members of the health care team, the patient, and the patient's family.
  - —The graduate maintains and respects patient confidentiality, and is aware of the uniqueness of the doctor–patient relationship.
  - —The graduate knows and admits the limits of knowledge, can deal with uncertainty, and respects the opinions of others.
  - —The graduate recognizes that the need to learn is continuous.
  - —The graduate balances personal and professional commitments to ensure that the patient's medical needs are always addressed.
  - —The graduate recognizes conflicts of interest in financial and organizational arrangements for the practice of medicine.

- The CCIA is now working to identify assessment instruments that will measure the extents to which students have mastered the graduation competencies as they progress through the curriculum.

Changes in Pedagogy

- Over the last five years, there has been a significant shift from delivering the curriculum almost exclusively in lecture format during the basic science portion to the use of small-group, case-based learning.
- While lectures remain an efficient method to transfer information, reduction in lecture hours with an increase in the use of experiential learning has been the trend and indeed, the goal.
- Students are taught the principles of searching clinical literature and the skills to critically appraise it.
- Standardized patients are used extensively for teaching and assessment purposes throughout the curriculum.
- Standardized patients are used to teach and assess history-taking and communication skills as well as general and specialized physical examination skills.
- Standardized patients are included in all core clinical clerkships at several sites, and are required in the fourth year at some sites.

Application of Computer Technology

- At present, only students assigned to the Chicago campus are required to have computers as well as an Internet service provider.
- Computers are available for students at all sites.
- There has been a significant change in the manner of information exchange between the students and faculty over the past ten years. Virtually all courses have Web sites, with varying amounts of course material available there, ranging from syllabi, lecture notes, teaching supplements such as simulations or models of biological processes, diagnostic images, clinical case banks, and question banks to computer-based examinations.
- The use of electronic databases is required during preclinical courses as well as during the clinical clerkships.
- Students are required to utilize on-line journals; the teaching hospitals are linked to the university by fiberoptic lines.
- The histology course in Urbana utilizes computer technology for a major part of its laboratory delivery. Lectures are complemented by online laboratories featuring the UICOM-UC Internet Atlas of Histology that contains an extensive set of histology images. The Web interface permits students to change magnification to examine areas of interest in greater details. There are over 1,000 labeled histologic features with functional descriptions.
- During the Introduction to Human Diseases Course in Urbana, first-year students are presented with a series of patients in a multimedia format on a compact disc. Each case illustrates a common clinical problem and provides a relevant clinical link to the basic sciences. Students independently review the case scenarios and then meet in small groups for discussion.
- Third-year students study the impacts of nutrition on patients with various medical problems during their medicine clerkship, with the opportunity to manage patients' nutritional needs through the compact disc series.
- Evidence-based medicine has become an integral part of the curriculum at all sites. Clinicians and librarians work together to provide the resources and instruction students need to develop search skills and the ability to critically appraise clinical literature.

Changes in Assessment

- Standardized patients have been used in the evaluation of medical students at the UIC-COM since 1988.
- The UIC-COM Clinical Performance Center was established in 1987.
- The scale and number of applications have increased dramatically over the past ten years.
- Computer-assisted self-assessment has been introduced on a large scale, as has computer case simulation for end-of-clerkship evaluation.
- In 1993, the College Executive Committee voted to eliminate the Clinical Certifying Examination (the senior comprehensive), and the dean charged the CCIA with developing a better system of clerkship evaluation.
- As a result, a competency-based evaluation system was introduced in which student performance was judged on the basis of well-defined standards or performance objectives, derived by each core clinical department.
- Grading criteria were made explicit and the process encouraged specific constructive suggestions from the faculty that would enable students to improve their performances.
- The new evaluation system provided a mechanism to recognize and respond to student difficulties that includes an opportunity to remediate deficiencies noted.
- While the system continues to evolve, it has provided the foundation for a competency-based evaluation system that identifies the components of competency and uses

performance data in a fair, objective, and defensible way to reach decisions about student progress.

Clinical Experiences

- Within the last ten years, students' clinical experiences have moved from primarily hospital-based to more outpatient experiences, and in some clerkships (family medicine) they are exclusively ambulatory.
- As community-based medical schools both Peoria and Rockford provide special emphasis on family medicine, with clerkship opportunities in rural, underserved areas. The Rockford Family and Community Medicine required clerkship begins early in the second year (half day/week), and continues (one day/week) through the third and fourth years.
- The longitudinal primary care experience provides early clinical experiences with community-based physicians on a one-to-one basis.
- Surgery clerks are spending significantly less time in the OR and more time in surgeons' offices as surgical patients first present, or are seen postoperatively.

Curriculum Review Process

- The medical school curriculum is always under review. The college has chosen to approach change incrementally.
- The college has attempted to capitalize upon the unique strengths of each educational site, while moving toward a more cooperative, collaborative relationship in order to achieve a well-integrated curriculum.
- The college encourages active teaching and learning, and has attempted to implement instructional techniques to facilitate meaningful learning.
- The college has introduced the "principles of evidence" as one of the guiding themes.
- Implementation of evidence-based medicine principles and acquisition of critical appraisal skills are recurring themes throughout the curriculum at all sites.
- A subcommittee is actively engaged in integrating the graduation competencies into the curriculum and ensuring that the appropriate assessment instruments are in place. This will indicate not only what students have learned, but also how effective the program has been in supporting and enabling that learning.
- Another curricular theme is to further the use of instructional technology. A technology subcommittee of the CCIA has been formed to create opportunities for collaboration among sites, disseminate references, facilitate faculty development, and actively encourage faculty to investigate the benefits of technology-assisted instruction.
- One of the charges to the CCIA is to evaluate the effectiveness of the UIC-COM curriculum and appraisal instruments used to monitor student progress through the curriculum.
- A systematic process to ensure regular review has been in place for some time.
- The entire process was reviewed and standardized three years ago to ensure that all the critical aspects of program evaluation were adequately and consistently addressed.

Northwestern University Medical School

RAYMOND H. CURRY, MD, AND JOHN X. THOMAS, JR., PHD

Curriculum Management and Governance Structure

- The executive associate dean for education is one of four executive associate deans (the others are responsible for research, faculty affairs, and clinical affairs. These four executive associate deans, the senior executive associate dean/chief operating officer and the dean/vice president for medical affairs comprise the school's executive administration.
- The school's educational programs all report to the executive associate dean (EAD) for education, except for PhD programs in the life sciences, which report to the EAD for research.
- Those reporting to the EAD for education include the medical degree program, the combined BA–MD program, graduate medical education, continuing education, and master's-level programs in public health (MPH), physical therapy, and genetic counseling.
- The educational administration, reporting to the executive associate dean, consists of seven associate deans (for Educational Programs, Student Programs, Medical Informatics, Admissions, Minority Affairs, the combined BA–MD program and Graduate Medical Program) and the directors of two special programs (the Program in Medical Ethics and Humanities, and the Program in Communication and Medicine).
- The governance structure, adopted in 1997 and modified in 2000, consolidates and coordinates the management of all educational programs much more effectively than before. Previously, each of the associate deans (e.g., for Admissions and for Educational Programs) reported independently to a position (vice dean) that was also responsible for many other operational functions of the school.
- A 14-member Education Council, composed of senior faculty (including selected department chairs) and appointed to three-year terms by the dean, advises the executive associate dean and serves as the policy-making body for educational affairs.
- The Curriculum Committee is composed of 12 faculty appointed at large from among medical school faculty actively involved in medical student teaching.
- The emphasis on at-large rather than departmental representation, adopted in 1988, has been a major factor in enabling the development of a centrally administered curriculum with many interdisciplinary features.
- The committee reports to the associate dean for educational programs.
- Proposals affecting educational policy are referred to the Education Council.

Office of Education

- The Office of Medical Education (OME) was established in 1984.
- For the first six to eight years, the office included one professional educator, a laboratory assistant, and two clerical staff.
- Concurrent with the development of a new first- and second-year curriculum that debuted in 1993, the OME was expanded to provide administrative support for all aspects of the preclinical curriculum and some components of the clinical curriculum.
- The office is now managed by the associate dean for educational programs and includes two professional educators, an administrative manager, four curriculum coordinators, a software technician, and three clerical staff.
- Most recently, the OME has taken on responsibility for the school's continuing medical education program and is developing a formal program in faculty development as well.

Budget to Support the Educational Program

- Budgets for the divisions of the education administration, including the OME, are developed and monitored by the executive associate dean.
- The education programs are funded by a combination of appropriations from the university and the medical school dean's office, extramural grants, service revenue, and income from several small endowments devoted to specific programs.
- The school and university are currently negotiating changes in their financial structure whereby tuition revenue would be directly managed by the medical school.

Valuing Teaching

- Each preclinical course has a director chosen from the faculty, with the advice and consent of department chairs.
- Directors of preclinical courses whose base salaries are not already paid by the school receive stipends from the dean's office.
- Eight clinical faculty "mentors" each work closely with a fourth of each medical school class; they also receive salary support from the school.
- Clinical clerkship directors are appointed and paid by the department.
- Income from two endowments is used to support the work of exemplary educators.
    - The Augusta Webster Faculty Fellowships in Medical Education are awarded to one or two faculty members every two to three years.
    - The Jacob R. Suker, MD, Chair in Medical Education supports the work of a senior faculty educator for a term of three to five years.
- Secondary faculty appointments in Medical Education are awarded to selected faculty with significant roles in educational administration and/or research.
- Each year the student body selects one faculty member from the first-year basic sciences course, one from the second year, and one from the third-year clinical clerkships to receive the George Joost Award for Outstanding Teaching.
- Three Dean's Awards for Teaching Excellence (for basic science faculty, full-time clinical faculty, and volunteer clinical faculty) are given each year.
- Comprehensive and detailed information about every faculty member's teaching activities will become available as part of the school's evolving plan for mission-based management. A portion of tuition revenue will then be distributed to departments to help defray the cost of teaching and to reward excellence.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In the late 1980s, as the first step in planning the school's major curriculum reform (enacted 1993), the dean led a faculty effort to identify a definitive statement of the overall goals of the medical curriculum. This statement then served as a template for subsequent development of course-specific goals and objectives.
    - The goal of the medical curriculum is to prepare broadly educated, responsible physicians capable of pursuing postgraduate education in any clinical discipline and/or pursuing a career in medically related research. This requires each student to attain facility in each of eight areas:
        —Knowledge of the scientific basis and language of medicine
        —Information management
        —Communication
        —Clinical data gathering
        —Clinical decision making
        —Professional attitudes based on an appreciation of medical ethics and humanities
        —Commitment to health promotion and disease prevention
        —Commitment to lifelong learning

Changes in Pedagogy

- The preclinical curriculum changed dramatically in 1993, with an entirely new curriculum featuring a comprehensive problem-based learning component, reduced lecture hours, integrated basic science courses, a new course in medical decision making, and a two-year-long course in professional skills and perspectives.
- Every course includes small-group discussion and/or preceptorial activities.
- Case-based materials are used to introduce concepts in most small-group teaching formats, including discussion groups, tutorials, and of course problem-based learning sessions.
- Patient instructors are used to teach communication skills and physical examination skills throughout the first year.
- Standardized patients are used for assessment at the end of the second-year clinical skills courses and in the third-year clerkships.

Application of Computer Technology

- Every student is required to own a computer that conforms to technical standards established by the university.
- Use of information technology in medicine is a major emphasis of our course in medical decision making, which starts on the first day of the first year of school.
- The preclinical curriculum relies heavily on electronic

mail and Web-based formats as the primary mode of communication between students and with faculty.
- There is increasing use of computer-assisted instruction and the intranet Web for the posting of reference material, announcements, and other messages.
- Each medical class maintains a separate Web page for academic resources and other information.

Changes in Assessment

- A clinical skills teaching and assessment program was introduced in 1993, concomitant with the new preclinical curriculum.
- Patient instructors and standardized patients are used to teach and assess students' communication skills, physical examination skills, and clinical reasoning skills on a regular basis.
- In addition to case-based standardized patient encounters, the assessments also include objective structured clinical examination stations focusing on specific examination components, laboratory interpretation, etc.

Clinical Experiences

- The required clinical clerkships use a wide variety of inpatient and outpatient settings.
- In the third year, a four-week interdisciplinary primary care clerkship and a six-week rotation, through various surgical subspecialties take place entirely in physicians' offices.
- The twelve-week internal medicine clerkship focuses on comprehensive patient management skills in the inpatient setting.
- Other clerkships involve a combination of hospital- and office-based activities.
- A fourth-year, two-week required rotation in physical medicine and rehabilitation exposes students to the interdisciplinary, team-based approach required for the care of extensively disabled patients.

Curriculum Review Process

- The Curriculum Committee reviews the evaluations of the preclinical courses and required clinical courses continually and regularly.
- Student review panels have been convened to review the same evaluations and offer recommendations to the course directors during the course and a comprehensive review to the Curriculum Committee at the end of the course.
- Following the successful reform of the first- and second-year curricula, a new effort is under way to extend the principles of that reform to the clinical curriculum.
- The school seeks enhanced coordination between clerkships and increased interdisciplinary activities, enhanced clinical skills teaching, and a focus on professional development issues, along with more rigorous assessment strategies.
- Every course in the preclinical curriculum conducts debriefing sessions with a student committee at the end of each course unit.
- The lecture-based courses have provision for written evaluations of each lecturer.
- For the required clerkships, each student is asked to complete an anonymous evaluation via a secure Web site. The information is distributed to the clerkship director, the dean's office, and the Curriculum Committee chair.
- The Curriculum Committee reviews summary reports from student committees and from course/clerkship directors annually, and also considers data from the individual student evaluations.
- The committee's evaluations and suggestions are communicated back to each course/clerkship director and to the department chairs; problems common to several courses or clerkships are also identified and addressed by the dean's administration.
- The Education Council conducts two or three internal reviews of specific educational programs or student services each year (e.g., in 1999–2000 the council reviewed the combined BA–MD program and the student financial aid system).

Rush Medical College

JOAN T. ZAJTCHUK, MD, MARGARET MCLAUGHLIN, MD, SUSAN K. JACOB, PHD,
AND DAVID M. ROTHENBERG, MD

Curriculum Management and Governance Structure

- The dean of Rush Medical College and the associate dean for Medical Student Programs (MSP) provide the strategic leadership in managing the educational program and in developing policies and procedures of the college.
- The dean and associate dean work closely with basic science and clinical department chairs, course directors, and faculty to implement innovations in education as the practice of medicine changes.
- The dean and associate dean provide guidance to the Curriculum Committee (CC), the Committee on Student Evaluation and Promotion (COSEP), and the Committee on Educational Appraisal (CEA).
- The CEA evaluates all courses yearly.
- Each of these committees has elected faculty and student members.
- The CC recommends modifications of the curriculum based on proposals from faculty and students, survey results, and evaluations by the CEA.
- All curricular changes are approved by the CC prior to implementation.
- The newly appointed acting dean of the college is also the senior vice president of medical affairs at Rush–Presbyterian–St. Luke's Medical Center (RPSLMC). This dual oversight strengthens the cooperation between the medical college and the medical center.
- The associate dean for MSP works with the other associate deans of the medical, surgical, and basic science departments and of the graduate medical education and continuing medical education programs.
- The dean and executive dean provide resources to departmental chairmen for the education program.
- The Office of Medical Student Programs (OMSP) was established in 1978 to support the educational program.
- The associate dean for MSP with the assistance of four appointed assistant deans oversees management of day-to-day activities in the clinical and preclinical disciplines and ensures that educational standards are met for internal and external reviews.
- The associate dean also oversees the college's admission office, the resident match, medical student minority affairs, and specialized programs that include the academic skills and tutoring program and the adviser program.
- The positions of assistant dean for minority affairs and director of specialized student services were recently added.
- An additional area of oversight is the OMSP centralized medical student database, supported by an on-site computer consultant. This database captures the demographic and undergraduate academic data for matriculating students, medical student performance data, and residency selection choices. This database is a useful resource for clinical and basic science faculty for research in medical education. It recently tracked the choices of primary care specialties of graduating seniors as influenced by their participation in community-service activities. This database provides quick and accurate retrieval of student academic records needed for internal review committees associated with oversight of the educational programs.

Office of Education

- Since Rush Medical College has no institutional office of medical education, the de facto support of the educational program rests in the Office of MSP and the dean's office.
- In response to the 1997 LCME survey, a Task Force on Faculty Development in Teaching (1998–1999) was convened.
- Task force recommendations, including the creation of an Office of Medical Education, are being considered at the senior vice president and associate dean's level for institutional implementation.

Budget to Support Educational Programs

- The executive dean's budget supports the operational needs of seven professional staff and nine support staff in the Office of MSP.
- The budget also pays departments for teaching based on an institutional formula that recognizes faculty contributions for didactic lectures and small-group and problem-based learning experiences.

- Teaching contributions are reviewed annually by the dean's office.
- The OMSP manages a separate budget for the educational program and administration of the alternative curriculum (AC). The AC program ended in summer 2000.
- Program requirements are now being defined in the preclinical years for the development and implementation of a proposed unified curriculum (UC).

Valuing Teaching

- Department chairs identify recognized teachers to be course directors and teaching faculty and are responsible for balancing their departmental duties with their teaching activities.
- Faculty are recognized for teaching excellence through several awards.
- Graduating seniors honor outstanding teachers with awards for preclinical, clinical, and best-resident teacher, and a special award designation, the "doctoral hooder" at the graduation ceremony.
- The Mark H. Lepper, MD, Society of Teachers of the college elects faculty members yearly to this society for teaching excellence by reviewing faculty and student nominations.
- The Rush Chapter of AOA now recognizes the best Resident Teacher of the Quarter and the best Volunteer Faculty.
- In April 1999, a Task Force for Faculty Development as Teachers recommended institutional-level recognition of teachers, the development of courses in teaching for faculty, residents, and senior students, and the development of a mentoring program. These proposals are under review for implementation.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Course directors (preclinical and clinical) define learning objectives for specific courses.
- The associate dean for MSP, the CC, and the CEA review learning outcomes for existing courses with course directors.
- The identification and use of outcome measures in specific preclinical and clinical courses is unevenly implemented.
- The UC planning task forces will standardize this process during curricular renewal, incorporating the school-defined institution-specific objectives of the medical college experience that the successful student must demonstrate prior to graduation.
- Outcome measures at the institutional level are being defined.
- Currently, learning outcomes are measured in clinical clerkships using National Board of Medical Examiners (NBME) mini-boards. In addition to faculty and resident evaluations, all second-year students must pass the USMLE Step 1 prior to progressing to the clinical clerkships and all students must take the USMLE Step 2 prior to graduation.

Changes in Pedagogy

- The parallel alternative curriculum track was offered to entering students from 1984 until 1998.
- Only the traditional curriculum (TC) track will be offered during the curricular renewal process.
- There has been an increase in small-group learning experiences using problem-based learning (PBL) cases to introduce basic science concepts within the TC.
- The college reported the results of a comprehensive survey of graduates (1974–1989) about the adequacy of their medical school experience to prepare them for the practice of medicine.
- Use of standardized patients began in 1996 within the interviewing and communication course and was also found in the Consortium examination (1996–1999).
- The changes in the practice of medicine and the increase in the use of small-group experiences in the TC prompted the recent curricular renewal effort (May 1998). Examples of changes during the last decade are briefly reviewed.
- Alternative curriculum track (AC): 1984–2000
  - In 1984, the college began a parallel track to the preclinical TC in order to teach basic science content using a Socratic, problem-based method. This AC track enrolled approximately 24 volunteers from a class of 120 entrants. These students met twice weekly in small groups (six students per group). Facilitators trained in the case-based PBL approach encouraged student groups to solve problems through hypothetico-deductive reasoning. Early implementation of this innovative track made Rush one of five medical schools to adopt this approach within the preclinical years (with Bowman Gray, Michigan State, New Mexico, and Southern Illinois; three of the schools had instituted similar tracks prior to Rush).

  - In 1986, an Evaluation Advisory Committee composed of basic science and clinical department chairs compared the efficacies of retention of scientific knowledge by the individual cohorts of AC and TC students during their clinical clerkships. Areas evaluated were personal responsibility for learning, clinical problem solving, doctor–patient relationships, interpersonal skills, faculty satisfaction, student psychological well-being, cost effectiveness, evaluation of program implementation, diffusion of ideas from the AC to the TC, and comparisons of scores on the NBME Part II.
  - The committee's report in 1990 recommended expansion of problem-based learning into the clinical years, as well as more teaching exposure in ethics, community medicine, and preventive medicine. It also endorsed the development of more computer-assisted problem-solving exercises. An evaluation of outcomes between the AC and the TC tracks, published in 1991, compared NMBE Part I and NBME Part II scores and scores on an oral exam. The AC track ended in the spring quarter of 2000.
- Traditional curriculum (TC): 1991–present
  - In response to a 1991 LCME survey, a Pre-clinical Task Force addressed the didactic and lecture burdens in the TC and in the basic science curriculum. It evaluated opportunities for increased academic interactions between the two tracks such as sharing of course content and faculty.
  - In response, some TC basic science course directors (physiology, neuroscience, and immunomicrobiology) increased the number of small-group workshops in traditional and computer-assisted laboratory sessions.
  - Over the last five years, preclinical small-group learning experiences increased in the ethics, behavioral science, microbiology, pathophysiology, and interviewing and communication courses.
  - The task force also developed strategies for curricular innovation in biomedical ethics, nutrition, geriatrics, cell and molecular biology, embryology, and medical informatics.
  - Preclinical course directors also identified areas of redundancy in content. The UC task forces (see below) are incorporating these recommendations into the curriculum renewal process.
- Generalist curriculum preceptor program (GCPP): 1992–present
  - Planning for this required two-year preclinical program began in 1992, with implementation in 1996.
  - This program provides students with first-hand experience in ambulatory primary care practice.
  - Community physician–preceptors act as role models to nurture student interest in primary care. Concurrent curricular restructuring involved the teaching of basic interviewing and physical diagnosis skills to both first-year and second-year students using classical didactic and workshop formats. These courses develop skills to improve a student's level of understanding and participation during preceptorship sessions.
  - The program allows better integration of basic science course work with a "hands-on" clinical experience.
  - Standardized patients are used in both years of the Interviewing and Communication course.
  - During the same time period, the Primary Care Task Force defined strategies and the resources needed to increasingly move to a generalist ambulatory setting in pediatrics, internal medicine, and family medicine. An important recommendation in their 1997 report was to enhance and preserve the GCPP during the preclinical years.
  - A complementary clinical experience for student volunteers is the Rush Community Service Initiatives Program (RCSIP). This grant-funded program reinforces the GCPP by allowing interested students, accompanying faculty volunteers working in interdisciplinary settings, to participate at community health clinics and homeless shelters. This program, formalized in 1991, reinforces those behaviors and values medical students need to further enrich their medical school experience.
- Unified curriculum (UC): Under development
  - The Curriculum Renewal Committee (CRC) was activated in May 1998 and included clinical and basic science course directors and department chairs.
  - The themes for curricular change include a patient-centered curriculum based on a demonstration of competency; integration of clinical and basic sciences in the preclinical years; the use of teaching methods to encourage self-directed learning; the expansion of the generalist approach that stresses ambulatory care, continuity of care, preventive medicine, and evidence/outcome-based medicine; a decrease in the number of didactic content hours; and an increase in the number of small-group, interactive experiences.
  - The curricular renewal process intends to incorporate the best features of the AC and the TC in the preclinical years.
  - The objectives of the UC include (a) an integrated organ-system approach to the basic sciences developed by basic science and clinical faculty, (b) an increased number of small-group, active-learning experiences for all students, (c) a reduction of student contact hours, and (d) integrated PBL sessions.

  - In the fall of 1999, the first-year planning and PBL task forces submitted their proposals for CC review.
  - The CC in January 2000 approved timelines to review the first-year proposals for content, educational soundness, and administrative support.
- An institution- and department-level review process is now evaluating the teaching demands of the proposal and the resources needed for implementation. The year two planning task force was identified.

Application of Computer Technology

- Students are not required to have computers.
- Course directors, who are early innovators, include computer technology applications in their courses.
- Rush University, under oversight of the Rush University Library, opened the McCormick Educational Technology Center in 1997. This center supports independent study and self-enrichment through the use of audiovisual and computer hardware and software. There is a 40-workstation computer classroom with 45 computers available 24 hours a day in addition to electronically connected small-group rooms and nine multimedia classrooms.
- In 1998, the medical center created a Center for Advanced Technology and International Health to promote the use of information technology in education, research, and health care delivery.
- The medical center recently designated a Section of Medical Informatics to promote the clinical use of information technology among affiliated institutions.
- All first- and second-year medical students were surveyed in 1999 to assess current computer skills and to identify their future educational needs.
- Specific courses using computer technology are physiology, histology, pathology, immunomicrobiology, and neurobiology.
- In neurobiology, students use computers in problem-based exercises, make PowerPoint presentations, do library and Internet searches, use CD-ROM programs for independent study, and use computer cases as surrogate facilitators. In the same course, students use an interactive Image-browser Atlas, use "Slice of Brain" videodisks, and participate in a "boards-style" testing module and on-line testing.
- Neurobiology course directors are pilot testing computer-facilitated case studies for Medical Student Grand Rounds.
- A graduate-level Rush University course in medical ethics is offered on the Web.

Changes in Assessment

- The Chicago Clinical Skills Consortium Examination was given to all spring-quarter second-year GCPP students from 1997 to 1999, using standardized patients to assess their competency in taking a history and doing a physical examination.
- In the preclinical years, the basis for student assessment is the written and practical examination; in the clinical years, both objective examinations and faculty observation are used.
- The use of computers and the use of standardized patients are described above.

Clinical Experiences

- In addition to the GCPP and RCSIP previously described, nine required clerkships (medicine, surgery, pediatrics, obstetrics–gynecology, psychiatry, family medicine, surgical selectives [subspecialties], neurology, and a subinternship provide clinical experience.
- The clerkships provide inpatient and ambulatory rotations at the Rush–Presbyterian–St. Luke's Medical Center, Cook County Hospital, and Illinois Masonic Medical Center (currently being phased out).
- Eighteen additional weeks of elective courses must also be completed.
- The Dean's Summer Fellowships, through partial funding, provide an additional clinical opportunity for first-year students to work under direct supervision of staff in community service, primary care, and international health projects.

Curriculum Review Process

- An important challenge to develop and implement the UC relates to an institutional commitment to adequately fund the administrative infrastructure and to provide operating funds to support educational goals and to measure outcomes of the educational process.
- Of equal concern is the limitation of faculty time to develop the new curriculum while teaching current courses.
- Provisions must be made to accommodate increases in small-group learning sessions and support the teaching faculty as they balance research and clinical-practice priorities.
- Department chairmen are discussing the increased teaching demands in the face of institution-wide budget re-

ductions and the pressure to obtain more externally funded research grants.

- An educational researcher and computer program consultant will collaborate with the planning task forces during the developmental stages of the UC. The elements of program design and content will be incorporated into the existing MSP database. For example, it is expected that courses, modules, and discipline grading, as well as outcome measures for the preclinical program, will be defined and tracked using this database.
- The CEA is evaluating a proposal to incorporate a quality-improvement process in course reviews. This is expected to decrease the turnaround time for CEA review, provide more timely reports for course directors to make improvements in course content or presentation, and develop a more standardized format to be used for on-line evaluations.
- The CC is discussing a proposal to adopt the problem-oriented-system (POS) approach to train medical students in PBL cases beginning in the first year. The POS approach may lend itself to a more objective evaluation of student knowledge.
- The unified curriculum (UC) proposals are undergoing extensive review at this time. You may obtain further information about the UC via e-mail to ⟨Joan_Zajtchuk@rush.edu⟩. (Joan T. Zajtchuk, MD, Specialist in MSA, associate dean, Medical Student Programs, Rush Medical College.)

Southern Illinois University School of Medicine

LINDA DISTLEHORST, PHD, AND TERRI CAMERON

Curriculum Management and Governance Structure

- A committee responsible for curriculum oversight has been in place since 1971 and was formalized in 1975. The current iteration is the Educational Policy Council (EPC).
- Faculty are appointed to the EPC by the Faculty Council.
- In 1994, the EPC began a curriculum review process that resulted in a new governance structure, with the main change being a limit on the number of department chairs who could serve on the committee; a move away from constituency-based representation for the remaining members, which included changing the status of curriculum committee chairs to ex officio, non-voting members; a direct reporting line to the dean rather than through the school's Executive Committee; and a replacement of the former EPC Executive Committee with an Operations Committee.
- Both the EPC Executive Committee and the EPC Operations Committee were composed of the curriculum committee chairs, the EPC chair, the associate dean for education and curriculum, the assistant dean for curricular affairs in Carbondale, the associate dean for student affairs, and the chair of the Student Progress Committee. However, the title, "EPC Executive Committee" evoked the perception that the curricular chairs were making decisions for the Educational Policy Committee.
- As part of the Curriculum 2000 (C2000) process, curriculum governance was again reviewed, and the C2000 Administrative Oversight Group has recommended creation of an Educational Policy Council responsible for the study and development of educational policy. The EPC is composed of the directors for each year and the Doctoring Streamer; four at-large, elected faculty; four students, and four ex-officio, non-voting members.
- As shown in Figure 1, while the EPC is responsible for educational policy, responsibility for curriculum implementation lies with a curriculum administration group composed of the associate dean for education and curriculum, the assistant dean for curricular affairs (Carbondale), the directors for each year, and the Doctoring Director, the EPC Chair, the Mentored Professional Enrichment Project coordinator, the Clinical Competency Exam Committee chair, and department chairs as ad-hoc advisers and consultants.

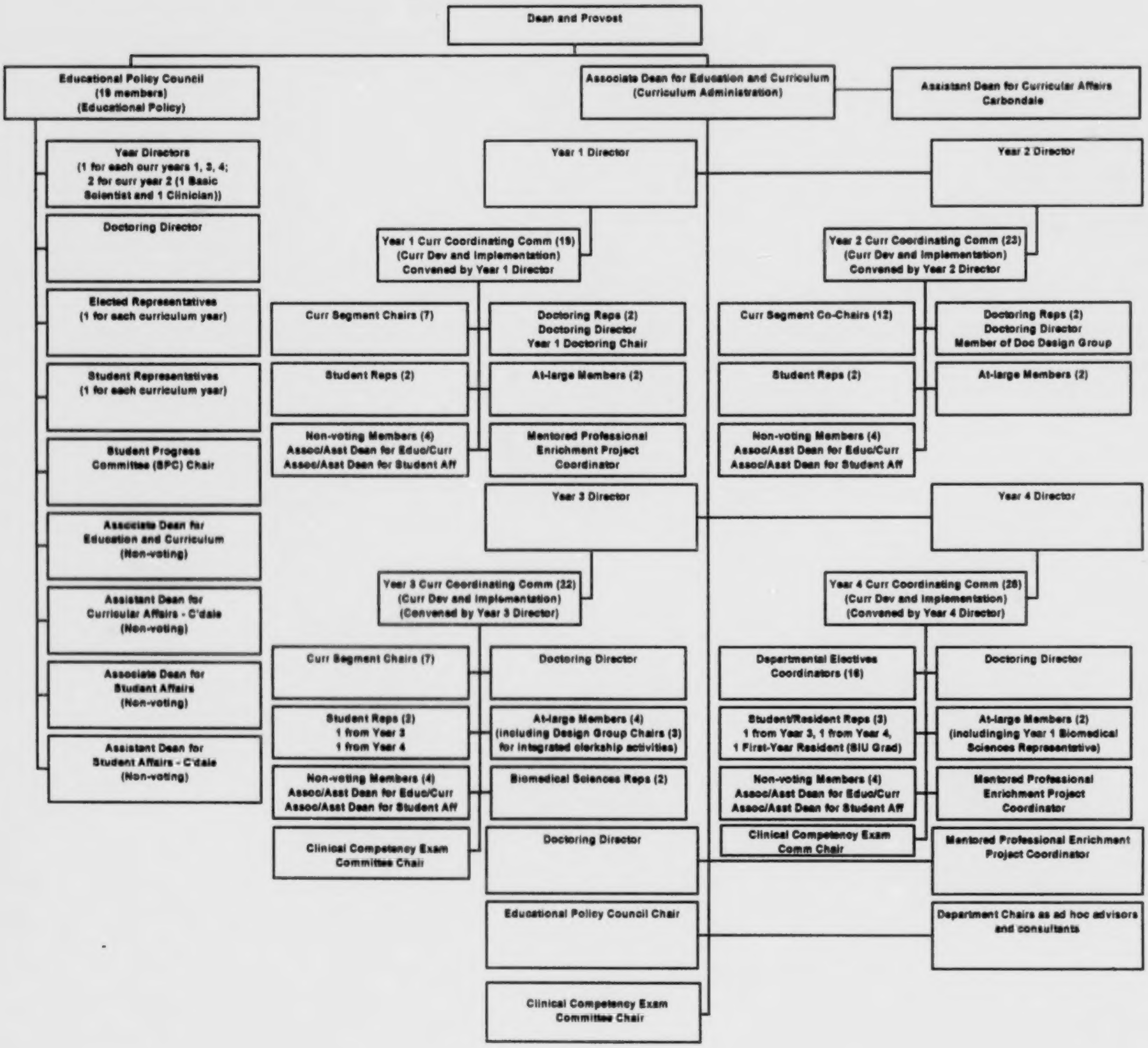
Office of Education

- The evolution of the Office of Education and Curriculum began with the founding of the School of Medicine in 1970, when community physicians and the dean began to develop the concepts that would become the SIU School of Medicine curriculum.
- Over time, both the Department of Medical Education and the Office of Education and Curriculum (OEC) evolved.
- The OEC oversees a wide range of educational resources and support such as the Professional Development Laboratory, where standardized patients augment instruction and assessment activities; printed resources; computer-based instruction and assessment resources; tutor rooms, classrooms, and study space; and support of curriculum committees and their respective curricular activities.
- Medical Education faculty play pivotal roles in supporting and enhancing these activities, and the majority of the staff in the OEC have faculty cross-appointments in Medical Education.

Budget to Support Educational Programs

- There has always been a discrete budget for the support of the educational program, and it comes from state-appropriated dollars. While the majority of these funds remain centralized, as the school has matured some funds have been moved to departmental budgets.
- The school is unique in that all of its curricular innovations, such as the standardized patient program, the performance-based examination of each fourth-year student, and the problem-based learning curriculum, have all been funded with state appropriations and have not had to rely on external funds for their continued growth and development.
- Because the school has as one of its strategic initiatives leadership in the development of an educational program that is centered on the changes of the rapidly evolving

FIGURE 1: Curriculum Governance Chart


Dean and Provost
Educational Policy Council (19 members) (Educational Policy)
Associate Dean for Education and Curriculum (Curriculum Administration)
Assistant Dean for Curricular Affairs Carbondale
Year Directors (1 for each curr years 1, 3, 4; 2 for curr year 2 (1 Basic Scientist and 1 Clinician))
Doctoring Director
Elected Representatives (1 for each curriculum year)
Student Representatives (1 for each curriculum year)
Student Progress Committee (SPC) Chair
Associate Dean for Education and Curriculum (Non-voting)
Assistant Dean for Curricular Affairs - C'dale (Non-voting)
Associate Dean for Student Affairs (Non-voting)
Assistant Dean for Student Affairs - C'dale (Non-voting)
Year 1 Director
Year 2 Director
Year 1 Curr Coordinating Comm (19) (Curr Dev and Implementation) Convened by Year 1 Director
Year 2 Curr Coordinating Comm (23) (Curr Dev and Implementation) Convened by Year 2 Director
Curr Segment Chairs (7)
Doctoring Reps (2) Doctoring Director Year 1 Doctoring Chair
Curr Segment Co-Chairs (12)
Doctoring Reps (2) Doctoring Director Member of Doc Design Group
Student Reps (2)
At-large Members (2)
Student Reps (2)
At-large Members (2)
Non-voting Members (4) Assoc/Asst Dean for Educ/Curr Assoc/Asst Dean for Student Aff
Mentored Professional Enrichment Project Coordinator
Non-voting Members (4) Assoc/Asst Dean for Educ/Curr Assoc/Asst Dean for Student Aff
Year 3 Director
Year 4 Director
Year 3 Curr Coordinating Comm (22) (Curr Dev and Implementation) (Convened by Year 3 Director)
Year 4 Curr Coordinating Comm (28) (Curr Dev and Implementation) (Convened by Year 4 Director)
Curr Segment Chairs (7)
Doctoring Director
Departmental Electives Coordinators (16)
Doctoring Director
Student Reps (2) 1 from Year 3 1 from Year 4
At-large Members (4) (including Design Group Chairs (3) for integrated clerkship activities)
Student/Resident Reps (3) 1 from Year 3, 1 from Year 4, 1 First-Year Resident (SIU Grad)
At-large Members (2) (includinging Year 1 Biomedical Sciences Representative)
Non-voting Members (4) Assoc/Asst Dean for Educ/Curr Assoc/Asst Dean for Student Aff
Biomedical Sciences Reps (2)
Non-voting Members (4) Assoc/Asst Dean for Educ/Curr Assoc/Asst Dean for Student Aff
Mentored Professional Enrichment Project Coordinator
Clinical Competency Exam Committee Chair
Doctoring Director
Clinical Competency Exam Comm Chair
Mentored Professional Enrichment Project Coordinator
Educational Policy Council Chair
Department Chairs as ad hoc advisors and consultants
Clinical Competency Exam Committee Chair

health care system, this centralized educational budget is positioned well for continued support.

Valuing Teaching

- Recognition of faculty whose primary responsibility is the medical student education program currently is handled at the department level.
- Through their respective programs, faculty can be promoted and tenured based on their involvement in education, and some clinical departments have created mechanisms that reward faculty educational productivity with clinical incentive dollars.
- A number of departments have created awards that rec-

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ognize teaching excellence based on peer, student, and resident feedback.
- Under discussion for the implementation of C2000 is a system that would reward and recognize faculty effort beyond the department by centralizing compensation and other modes of recognition in the educational administrative structure.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- SIU built its early reputation on its attention to the creation of behavioral objectives for every instructional unit in the undergraduate program. After these course and unit objectives were developed, the faculty, through an iterative process, created a set of exit objectives that defined the knowledge, skills, and behaviors the school wanted every graduate to possess. Since their initial development, these objectives have undergone regular review by the faculty through the Educational Policy Committee. A C2000 study group undertook the most recent review, adding a set of general goal statements as well as a list of patient problems.

Changes in Pedagogy

- The curriculum was first recognized as a mastery-based system of medical education. The faculty added a problem-based learning curriculum track as an alternate to the existing curriculum in 1990.
- The new track relied on small groups, with faculty as facilitators, and students assuming responsibility for determining what and how they need to learn to solve selected patient problems.
- Assessment was performance-based, focused on five objectives (knowledge, clinical reasoning, self-directed learning, clinical skills, and interpersonal and group skills), and occurred within the tutor group as well as at the end of each unit.
- C2000 will incorporate case-based, small-group learning throughout its four-year curriculum, requiring students to learn the basic sciences in their clinical context, the emphasis shifting from the basic sciences to the clinical sciences as students progress. Assessment will be performance-based. The design depends on interdisciplinary and inter-campus teams of faculty working together as facilitators, mentors, content resources, and evaluators.

Application of Computer Technology

- Students may use financial aid funds to purchase computers, but they are not required to do so.
- While students are not currently required to have computers, C2000 students will be encouraged to matriculate with laptop computers with wireless network cards.
- While computers and computer-assisted instruction and assessment are made available, they are not fully integrated into the curriculum.
- Students are given a half-day of training at the beginning of the first and second years that includes electronic mail, computer hardware and software resources, and information resources.
- Students have opportunities to use distance (distributed) learning as part of the tutorial process, using collaboration software to “meet” from remote sites.
- Students in the PBLC are also required to use Web-based forms to document learning issues and clinical experiences and to evaluate tutors, cases, assessments, and each unit.
- Web-based logbooks, documentation of learning activities and clinical experiences, and evaluation forms are used in some clerkships.
- Requirements for presentations in clerkships and the residency application process result in students' learning to use word processing and presentation software.
- Fourth-year electives in medical informatics are offered.
- Student educational areas have been connected to the wireless network to facilitate a curriculum that relies heavily on Web-based resources.

Changes in Assessment

- While faculty have historically used a variety of assessment methods, depending on the learning goals, the emphasis in C2000 will be on performance-based assessment.
- Standardized patients have been used for both learning and assessment at SIU since the late 1970's. In assessments, they are used to evaluate a number of skills ranging from physical examination maneuvers and interpersonal communication skills to the ability to orchestrate a complete patient encounter, including patient education.
- The SP program, administered through the OEC, currently has more than 100 people, from their teens into

their seventies, serving as "extra-help employees" in this capacity.

- Standardized patient assessments are used in the first- and second-year courses, the clerkships, and a performance-based assessment (the CCX, see below) of each fourth-year student to determine readiness for graduate education.
- Standardized patients are also used in a diagnostic technique called "stimulated recall." Students, residents, and faculty can request a stimulated recall when a student or resident has difficulty with problem-solving activities. This technique requires the student to interview and examine the patient under observation by a clinical and basic science faculty member. This encounter is also videotaped. After the patient encounter, the student and a trained faculty member review the videotape, and at certain times the faculty stimulator stops the tape and asks the student to explain why a certain question was asked or why certain physical examination maneuvers were performed. This technique helps determine whether the problem is because of knowledge deficits or because the student is unable to apply his or her knowledge to the problem.
- Students are required to complete a 15-patient clinical competency examination (CCX) that evaluates their readiness for residency training. The panel of patients is designed to sample all aspects of clinical practice. One or more faculty observe the majority of SP encounters.
- First- and second-year courses and third-year clerkships use OSCEs in addition to SP cases to evaluate students' clinical skills competencies. A computer-based patient follow-up session requires students to respond to scientific questions about each patient problem, using a free-text grading rubric to score responses.
- Computer-based patient cases have been used for instruction and assessment since 1995. As the software used to develop and administer such cases has been enhanced over the years, their use has also expanded.
- Faculty-generated software is also used to enhance teaching of the renal process, hypertension, cardiology, and pathology.

Clinical Experiences

- As a community-based school, SIU School of Medicine has provided clinical experiences in full-time and volunteer (preceptor) faculty offices and clinics, as well as in hospital wards.
- Students rotate through a wide range of community clinics, including the Illinois Department of Public Health Sexually Transmitted Diseases Clinic, the Veteran's Administration Medical Center, nursing homes, and community support networks.
- In the family and community medicine, neurology and psychiatry clerkships, students spend several weeks at rural preceptor sites, working side by side with their preceptors in clinics, hospitals, home visits, etc.
- In C2000, student interactions with community agencies will increase as students participate in more clinical activities, including such things as hospice visits during the neoplasid course, the Alzheimer Support Group during the neuromuscular course, and the Libertas program during the medicine and behavior course.

Curriculum Review Process

- Curriculum 2000 recommendations
    - *Students should be encouraged to become self-directed, life-long learners.* Medical school should model the behavior expected of the trained physician. The student should be encouraged to take responsibility for his or her continuing educational development.
    - *Students should be exposed to a variety of clinical settings throughout their entire undergraduate education and should be expected to show progressive development of skills and professional behaviors.* Students will be assigned to a variety of clinical preceptors throughout their undergraduate careers. In these settings they will develop their clinical skills, their socialization into the profession, their appreciation of the roles of diverse health care professionals, their understanding of the economics of health care delivery, and the nature of the physician–patient relationship. Students will be expected to show developing levels of patient care and responsibility as they move toward their residency training.
    - *Learning of basic and clinical sciences shall be integrated.* The basic sciences shall extend beyond the "classic eight" (anatomy, biochemistry, physiology, behavioral sciences, pharmacology, microbiology, immunology, and pathology) to include ethics, humanities, epidemiology, nutrition, and biostatistics. Wherever possible the basic sciences should be learned and evaluated in the context of solving patient problems.
    - *Active learning in small-group settings should be encouraged.* Wherever possible, learning should occur in small groups with active participation by all members. Not only is this deemed to be educationally effective, but it will also develop those interpersonal skills necessary to function as members of multidisciplinary teams in health care delivery.
    - *The curriculum shall develop the flexibility necessary for*

students to function in the rapidly evolving health care delivery system, and in a variety of roles such as individual patient care, community health, and preventive medicine. Students should develop the skills to respond to evolving societal needs, practice patterns, and scientific developments.

  - *All curricular events should be evaluated; such evaluations should be diverse in style and performance-based.* Given the variety of skills, knowledge, and attributes expected of our graduates, we anticipate that they will be evaluated in a diversity of ways, including self-evaluation. All such evaluations should be performance-based (defined as assessing the application of knowledge and skills in settings approximating actual clinical situations).
  - *The following content areas should receive emphasis in the new curriculum: history and physical examination skills, medical practice management, health policies, evidence-based medicine, resource acquisition and medical informatics, and opportunities to explore diverse career choices.*
  - *Where appropriate, management of the curriculum should be by interdisciplinary teams that cross geographic and calendar barriers.*
- Curriculum 2000 goals

  The mission of SIU School of Medicine is "to assist the people of central and southern Illinois in meeting their present and future health needs through education, service and research." In serving this mission our goal is to prepare students to be physicians who
  - are compassionate, tolerant, and respectful in caring for patients and trustworthy and truthful in all of their professional dealings;
  - understand the scientific basis of medicine and are capable of applying that knowledge in the practice of medicine;
  - are highly skilled in providing care to individual patients;
  - are self-directed lifelong learners capable of employing systematic approaches for promoting, maintaining, and improving the health of individuals and populations;
  - understand the roles of other health care professionals and collaborate with and learn from them in fulfilling their roles as clinicians and patient advocates;
  - are skilled in the critical appraisal of new scientific knowledge and its application to clinical practice;
  - recognize and accept limitations in their knowledge and clinical skills and are committed to improving their knowledge, ability, and habits and patterns of practice;
  - through knowledge of health care policy and practice issues are responsive to the changing environment of health care;
  - recognize that spirituality and cultural beliefs are important elements of the health and well-being of patients; and
  - advocate the interests of patients over self-interest and their own personal rewards.
- The design of the process used (or under way)
  - Study group phase (January–May 1999)
    - —12 study groups
    - —50 meetings
    - —128 faculty
    - —29 students
    - —12 staff
    - —155 articles reviewed/referenced by groups
    - —Publication of study group reports to all faculty and students
    - —Presentation to faculty
  - Vertical integration phase (May–July 1999)
    - —Four vertical integration groups
    - —10 meetings
    - —40 faculty
    - —12 staff
    - —Publication of vertical integration group reports to all faculty and students
  - Design phase I (July–December 1999)
    - —16 design groups
    - —70 meetings
    - —240 faculty
    - —Ten students
    - —Ten staff
    - —Three design group chairs' meetings (July, October, December)
  - Design phase II (January–July 2000)
    - —16 design groups
    - —70 meetings
    - —240 faculty
    - —Ten students
    - —Ten staff
    - —1.5-day design-group chairs' retreat
    - —Meetings of vertical integration groups as necessary
    - —Monthly meetings of design group chairs for each year
  - The planning resources needed
    - —Staff and computer resources to schedule meetings
    - —Funding for faculty development
    - —Funding for large-group meetings and retreats
    - —Funding for printing of references and reports
    - —Creation and maintenance of Web pages and discussion group
  - The implementation resources needed
    - —Increased funding for standardized patients
    - —Expansion of Professional Development Laboratory
    - —Increased funding for educational resources such as big-screen computers, educational software

    - —Conversion of paper curriculum resources to Web-based resources
    - —Funding for faculty development
  - The challenges and unanticipated outcomes of the process
    - —Faculty and student resistance to change
    - —Keeping faculty and students apprised of the process and progress
    - —Dealing with misinformation
  - Plans for evaluation of the change
    - —Program Evaluation Working Group
- One of the major recommendations in the 1994–1996 EPC Curriculum Review was the creation of an Education Review Process. An EPC Education Review Committee Operating Paper was also developed.
- In addition to the current review process, a C2000 working group was established to create a program-evaluation plan. This plan, using the traditional program-evaluation model, is being created around five major objectives: determining whether graduates of the new curriculum function differently than previous graduates, determining the impacts of the new curriculum on the faculty and on students, comparing the costs of the current and new curricula, and identifying any unintended consequences and outcomes.
- A variety of methods will be used to gather data for each objective, ranging from simple performance data on internal and external assessments of student performance to periodic reviews by external review teams that can determine whether the school is migrating from its guidelines.

Indiana University School of Medicine

PAULA S. SMITH, EDD, AND HERBERT E. CUSHING, MD

Curriculum Management and Governance Structure

- A process of curricular review resulted in the recommendation to modify the governance structure of the education program.
- The Education and Curriculum Committee (ECC) was replaced with the Curriculum Council (CC).
- The CC is much larger than the ECC and allows more faculty, students, and administrators the opportunity to participate in the governance structure.
- The CC has a large number of members clustered in five small working groups, which has proven very productive.
- The five working groups of the CC are the Curriculum Council Steering Committee, Component I, Component II, the Clinical Component, and the Competency Directors Group.
    - The Steering Committee gives direction to the CC and has curricular approval authority.
    - Component I has oversight responsibility for the first-year curriculum.
    - Component II has oversight responsibility for the second-year curriculum.
    - The Clinical Component has oversight responsibility for the third and fourth years of the curriculum.
    - The Competency Directors Group is charged with oversight responsibility of the directors' respective competencies and is responsible for the implementation of the competency-based curriculum.
- In addition to the CC, the Academic Standards Committee (ASC) is charged with evaluating the educational program; analyzing results of the USMLE, statewide exam, and Objective Structured Clinical Examination (OSCE); monitoring educational equivalence across the nine campuses; reviewing students' evaluations of courses and instructors; and recommending grading distribution policies. Faculty, students, and administrators serve on the ASC.

Office of Education

- The school does not have an office of education; however, the curricular evaluation and assessment area in the dean's Office for Medical Student Academic Affairs provides support to the educational program, faculty, and administration.
- The above area was established in the early 1980s as "educational support," which consisted of one professional (master's level) and one clerical staff member.
- The office's responsibilities began to increase in 1996, and in 1998 the area was reorganized and renamed to reflect its increased responsibilities.
- Curricular evaluation and assessment currently has three professional staff (one doctorate, two master's) and two clerical staff. Recruiting efforts are under way and during the 2000–2001 academic year the unit will increase in size to five professional staff (one doctorate, four master's) and three clerical staff.
- The primary responsibilities of the unit are to assist with the implementation and evaluation of the competency-based curriculum; continue evaluating the traditional discipline-based curriculum; support the CC, the Academic Standards Committee, and the Student Promotions Committee; manage the student-evaluation program; organize the summer remedial program; serve as the school's contact to the National Board of Medical Examiners (NBME) for USMLE and shelf exams; provide educational assistance to faculty; support the OSCE program; and conduct scholarly research in the area of medical education.

Budget to Support Educational Programs

- There is not a discrete budget identified to support the education program.

Valuing Teaching

- Faculty interested in the medical student education program are recruited using the faculty listserv, campus publications, announcements at committee meetings, and word of mouth.
- Faculty interested in medical education are recruited to serve on the CC or the Academic Standards Committee, assist with the implementation of the competency-based curriculum, and write cases or serve as faculty evaluators with the OSCE program, and are encouraged to develop

on-line medical education resources and pursue other scholarly activities.

- Faculty recognized for their teaching are identified by nomination, self-selection, and department chair recognition.
- Outstanding teaching faculty are eligible for annual Teaching Excellence Recognition Awards as well as teaching awards given by each year's graduating class.
- Fifty thousand dollars is awarded to the school's faculty annually for educational research and development grants (up to $7,500 each). Faculty development opportunities are funded through the dean's office.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school has a statewide system (nine campuses) for the first two years.
- The basic science disciplines have agreed to present an 80% core of information to all students, with the remaining 20% of the course reserved for enhancements based upon the strengths of individual faculty.
- The 80% core is negotiated by all course directors at statewide discipline meetings, and department chairs are responsible for monitoring the academic content of the courses throughout the state.
- Some disciplines base their statewide discipline examinations on the core material while other disciplines use an external examination such as an NBME subject exam.
- In addition to the core material in each discipline, the school has adopted a competency-based curricular layer that requires all students to achieve level 1 (beginning) and level 2 (intermediate) mastery in
  - effective communication
  - basic clinical skills
  - using science to guide diagnosis, management, therapeutics, and prevention
  - lifelong learning
  - self-awareness, self-care, and personal growth
  - the social and community contexts of health care
  - moral and ethical judgment
  - problem solving
  - professionalism and role recognition
- Students are required to demonstrate mastery of three of the competencies listed above at the advanced (or third) achievement level to be eligible for graduation.

Changes in Pedagogy

- There have been increases in small-group learning experiences, problem-based learning, computer-enhanced instruction, self-directed learning, and the use of standardized patients for assessment.
- The dean recently allocated funds to renovate an existing facility that will be dedicated to teaching and assessing competencies and clinical performance using standardized patients. The facility is scheduled to be operational by the fall of 2000.
- The school is in the process of constructing a student center that will house several small-group conference rooms and will be equipped with a facility for distance education.

Application of Computer Technology

- Students are required to have their own computers upon matriculation.
- Curricular exposure to computer technology begins in the Concepts of Health and Disease (CHD) course during the first year. CHD is a problem-based-learning course that requires students to use the Internet (and other sources) for information.
- The Evidence-Based Medicine (EBM) course provides the syllabus, class notes, exercises, quizzes, grades, bulletin board, and administrative information on its Web page. Students must regularly access the information to succeed in the course.
- At the end of the first year students take a statewide triple-jump examination via the Web.
- Second-year students are given a CD that contains pathology slides, notes, and syllabi for use during their second-year pathology courses. In addition to the CD, class notes, grades, and other information are housed on the general pathology course director's Web page.
- Students take a required course in medical informatics that relies heavily upon use of the computer.
- In addition to the courses with formal computer requirements, students must show mastery of achievement levels 1 and 2 of the lifelong learning competency, which has a large computer technology component.

Changes in Assessment

- The school has adopted statewide discipline examinations.
- The school has begun to use standardized patients, on-

line testing, faculty observation, OSCEs, and triple-jump examinations to assess students' knowledge and skills.

- Currently all 280 students in each class are required to take a multi-station OSCE at the end of the second year and the end of the third year. Each student's performance is scored, videotaped, and reviewed with the student by a faculty member.
- As the OSCE program development continues, plans are to develop a competency and clinical performance assessment portfolio for students.

Clinical Experiences

- Students have early clinical exposure during the Introduction to Clinical Medicine and Neurology courses in years one and two.
- During the third and fourth years students have opportunities to see a wide variety of patients in both inpatient and outpatient settings as they rotate through Indiana University Hospital, Wishard Hospital (county hospital), Riley Children's Hospital, the Veterans Administration Hospital, Methodist Hospital, and physicians' offices across the state.

Curriculum Review Process

The first four bulleted items in the list below came from "The Indiana Initiative: Physicians for the 21st Century," an internal document produced to guide the implementation of the Indiana University School of Medicine's new curriculum.

- In 1992, the Indiana University School of Medicine (IUSM) initiated a process of curriculum review, faculty development, and curriculum planning.
- The first two phases of the review, the study phase and the design phase, represent a significant commitment of time, effort, and creativity on the part of faculty, staff, students, and administrators at IUSM.
- The process was characterized by strong faculty ownership and based in a strong faith in the quality of the undergraduate medical program and the medical students.
- Based upon extensive information-gathering and analysis, and informed by a common vision of the future of health care, this faculty-driven process culminated in both a shared vision of the successful graduate and a plan for achieving that vision.
- The five working design teams produced a comprehensive set of recommendations that addressed five facets of the curriculum: (1) a core knowledge base; (2) the adoption of a competency-based curriculum (competencies listed under Learning Outcomes); (3) recommendations for the improvement of integration between the basic and clinical sciences; (4) an institutional framework and plan for evaluation and assessment; and (5) a faculty governance structure that ensures integration of the knowledge base and competencies, and facilitates ongoing improvement of the curriculum.
- A summary of the recommendations follows.
  - The basic science disciplines are responsible for teaching and learning objectives that provide the medical students with a core of information that establishes the scientific basis of medicine and prepares students to integrate continuing advances in medical sciences into their knowledge of medicine.
  - The basic science core content will be presented in a logical sequence that promotes and maximizes integration and coordination among basic and clinical science disciplines.
  - The basic science curriculum will be organized in a manner that features and maximizes active learning opportunities.
  - The basic science curriculum will prepare students for lifelong learning.
  - Clinical science will be incorporated into the early years of medical school; basic science teaching will continue through the later years of medical school.
  - Faculty development and protected time for teaching will be essential for integrating basic and clinical teaching and for the facilitation of more active learning environments.
  - A competency-based curriculum will be adopted.
  - An administrative structure that ensures that focus on competencies is integrated into the curriculum throughout the medical school will be developed.
  - Mechanisms to evaluate and assess the students' mastery of the competencies must be developed and used.
  - Departments that rely on residents to provide the significant portions of students' medical education should give those residents training to enhance their skills as educators.
  - Resources required for the implementation, evaluation, and assessment of the new curriculum will be identified and dedicated early in the implementation process.
  - Academic units with responsibility for student instruction will use at least one evaluation instrument common to all instructional sites. Performances on common evaluation instruments should be monitored, cross-sectionally and longitudinally, as one aspect of program evaluation.

  - A centralized, multidisciplinary program will be developed to assist the teaching and assessment of clinical skills, attitudes, and knowledge, building upon experiences obtained from departmental assessment programs.
  - A centralized mechanism will be developed for identifying and meeting learners' remediation needs.
  - Students will continue to be given the opportunity to evaluate courses, clerkships, electives, and instructors.
  - School-wide coordinated policy for managing data as an institutional resource will be developed.
  - The CC should be created.
  - The Evaluation and Assessment Committee should be created.
  - The component committees should be created.
  - The competency committees should be created.
  - The Office of Academic Affairs should be created.
- In September 1996 the faculty voted to accept the recommendations made by the committees and begin implementation plans.
- The CC and its subcommittees were formed and the 1997–98 and 1998–99 academic years were used to pilot some curricular changes.
- The competency-based curriculum was instituted for first-year students during the 1999–00 academic year.
- The entering class of 1999 was the first class to have the successful completion of the competency-based curriculum as a requirement for graduation.
- The implementation of the four-year curriculum will be fully realized during the 2002–03 academic year.
- The CC is charged with ongoing review of the curriculum. The school's Education Subcommittee of the Strategic Planning Committee is charged with reviewing the educational focus of the school and making recommendations for educational program improvement.
- The school has developed regression equations to predict students' performances on a variety of measures (USMLE, statewide exams, basic science GPA, clinical GPA, and performance during the first year of residency).
- The AAMC Graduation Questionnaire results are reviewed and the school conducts a content analysis of the open-ended comments.
- Student evaluations of courses and instructors are reviewed.
- The performances of students at the medical education centers on USMLE Steps 1 and 2 and on the statewide exams, and a survey of residency directors about graduates' performances, are all reviewed and applied to curricular review.

Future Goals and Challenges

- In the next five years the school will be likely to address the following issues: (1) restructuring the Dean's Office for Medical Student Academic Affairs, (2) creating an office or a department of medical education, (3) building a dedicated facility for competency and clinical performance training and assessment, (4) increasing student satisfaction with the educational process, (5) fully implementing the competency-based curriculum, and (6) developing and adopting competency-assessment tools.

University of Iowa College of Medicine

CURRICULUM COMMITTEE

Curriculum Management and Governance Structure

- Prior to July 1994, management of the medical curriculum at the school was accomplished at several levels, including the dean's office, the Medical Education Committee, departments, and course directors. Overall management of the basic science and clinical curricula was the responsibility of the dean's office.
- While faculty indicated they had a clear idea of what constituted core subject matter, few said they knew enough about the curriculum to coordinate their teaching with other areas to which students are exposed. Such findings emphasized the need for some degree of increased central accountability for the curriculum.
- In the late 1980s the medical curriculum at the college of medicine was experiencing curriculum gridlock. New material and content could be added only at the expense of courses currently being taught. Lack of centralized curricular authority to make and implement decisions judged best for the college contributed to this gridlock.
- Faced with such problems and conflicts, the faculty in 1990 approved an initiative to review the entire medical curriculum. This review, involving an evaluation phase and a developmental phase of a new curriculum, covered several years.
- The college uses a two-tiered system for the curriculum development, implementation, evaluation, and review.
- Broad oversight for evaluation and review is lodged in the Medical Education Committee, which is chaired by a faculty member and includes representation from most departments and each medical student class. This committee is also responsible for interviewing and recommending to the dean candidates for the funded curriculum director positions.
- Since 1995 the institutional curricular authority has been centralized in the Curriculum Committee, a standing subcommittee of the Medical Education Committee.
- The Curriculum Committee is responsible for curriculum development, implementation, and evaluation. Initially meeting on a weekly basis and now biweekly, the group continues to review and refine the "new curriculum." While each curriculum director is responsible for a segment of the curriculum, the committee allows for broad input and discussion of curricular issues.
- The Curriculum Committee is composed of the associate dean for student affairs and curriculum (chair), two assistant deans for student affairs and curriculum, nine faculty members serving in the role of curriculum directors, four curriculum coordinators salaried by the college of medicine, the chairman of the Medical Education Committee, the director of the Office for Consultation and Research in Medical Education, a program associate with instructional design expertise from the Office for Consultation and Research in Medical Education, and four students—one from each community/class.
- Curriculum directors are supported financially by the central administration for a maximum of 50% of their salaries in order to subsidize their efforts in curriculum management.
- Curriculum directors are members of the faculty and play key leadership roles in the development and implementation of the revitalized medical curriculum. General responsibilities include but are not limited to
    - working with appropriate faculty to develop semester/course goals and objectives;
    - developing teaching processes appropriate to content (e.g., number of contact hours, self-directed learning, problem-based learning, small-group activities, and/or laboratory activities);
    - integrating content among prerequisite, concurrent, and subsequent courses; and
    - assisting in the identification of critical themes (e.g., women's health, geriatrics, nutrition) for longitudinal incorporation in the curriculum.

Office of Education

- The Office of Consultation and Research in Medical Education (OCRME) was established in 1970.
- Since 1994, the nature of OCRME's activities has changed substantially, with an increased emphasis on faculty development, curriculum evaluation, and support for administration of the curriculum through committee work, consultation, and project support.
- Funding for the office has shifted from primarily external support to internal support.

Budget to Support Educational Programs

- In 1994, the dean made monies available to support curricular reform.
- A proportion of these funds supported the efforts of a group of faculty chosen through a competitive application process to be curriculum directors. This group of faculty, who were named in March 1995, continue to receive support from the dean's office to carry out responsibilities relating to curriculum management.
- The college has achieved initial success in its goal to endow these positions through fund raising in support of collegiate professorships.
- The Office of Student Affairs and Curriculum was given a budget and the necessary staff support to centralize aspects of the curriculum.
- A four-semester interdisciplinary course, Foundations of Clinical Practice, is currently managed through the dean's office and is organized and run by the designated curriculum directors.

CURRICULUM RENEWAL PROCESS

The school has been actively involved in curricular innovation since the initiation of a detailed review in 1991. The college's revised curriculum was implemented in the fall of 1995. In addition to a greater emphasis on small-group learning, centrally managed integration of material, new courses, and earlier clinical exposure—especially in the ambulatory setting—this curriculum and the college have stressed commitment to students' success and partnership with them as junior colleagues.

- The concerns driving the curricular renewal include
  - shift of the site of health care delivery and thus of clinical medical education from the hospital inpatient ward to the ambulatory clinic and the practitioner's office
  - exponential growth in medical knowledge and the resulting curriculum gridlock
  - shift in focus from disease treatment to health maintenance and preventive medicine
  - increased emphasis upon self-directed and lifelong learning skills
  - revolution in information management
  - increased demand for generalist physicians

Learning Outcomes

- In the past academic year the school has initiated a comprehensive method for curriculum review based on the Medical School Objectives Project sponsored by the AAMC.
- Goals of the curriculum include
  - broadly-based medical education with greater centralization of management
  - integration of material on all levels
  - greater emphasis on problem-solving skills with a shift from lectures to interactive/small-group instructional formats
  - earlier clinical exposure to patients
  - enhanced ambulatory- and community-based educational experiences
- The school has embarked on a novel community system linking the student, curriculum management, and the school's social contract through service learning. This effort goes by the acronym CELLS—Communities for Excellence in Learning and Leadership for Society. (CELLS is discussed later under Learning Communities.)
- The college has carried out a comprehensive outcomes assessment that, among other achievements, indicates that these endeavors have accomplished a major increase in the use of the library and its associated computer learning center; 99+% pass rates on Step 1 and Step 2 of the USMLE; and better than average evaluations by graduating fourth-year students in their assessments of the Office of Student Affairs and Curriculum.
- As the college enters the 21st century, it is looking forward to moving its educational programs into a new building that will open with the fall semester of 2001. This facility has been carefully designed to link curriculum initiatives, small-group learning, competency development and testing, student management, and our community effort.
- Timeline
  - Fall 1995, revised curriculum implemented for the entering class
  - Fall 1996, revised curriculum began its second iteration, and the second and third years of the revised curriculum were implemented
  - Spring 1999, graduated first class to complete all four years

Changes in Pedagogy

- There are a number of new courses during the first two years:
  - Cell biology lays a foundation for subsequent learning from the increasingly important perspective of molecular and cell biology.
  - Medical genetics explores the recent growth of un-

  derstanding in this field and links basic scientific principles to their clinical manifestations.
  - Foundations of Clinical Practice, a progressive four-semester comprehensive sequence, addresses prevention and biostatistics, cultural issues in medicine, the dying patient, ethics and the law, and communication and examination skills. The sequence includes a longitudinal case-based learning experience. For the first two semesters, students meet weekly in small groups to discuss paper cases that are designed to help students integrate what they are learning in other courses. During the third semester, students participate in patient-centered learning. They work in pairs with actual patients but continue the small-group discussion of learning issues. During the fourth semester, students work with their own patients. Goals of this longitudinal experience are to help students develop self-directed learning skills (including evidence-based medicine), to help them improve their written and verbal communication skills, and to help them learn to work as part of a team.
  - Structure and Function of the Human Organ Systems is a semester-long integrative course that includes perspectives in physiology, histology, and medical imaging.
  - Immunology addresses basic and clinical issues in human immune responses.
- There are also several new clinical courses:
  - Clinical Beginnings is a week-long experience prior to the third year.
  - The community-based primary care clerkship includes a component of preceptorship in a private practice with several primary care physicians, as well as experience with a variety of community health care agencies and resources and a lecture component. Students elect to complete this rotation at one of the six regional medical education centers throughout the state of Iowa. Students participate in the practices of physician instructors in the host cities and in other, more rural communities in that region of the state. This new course emphasizes first-contact clinical experiences in primary care with a special focus on continuity. Students have the opportunity to develop their clinical skills and to learn about the myriad ways physicians work in communities to enhance the health and well-being of individuals and families. The clinical disciplines involved include family practice, internal medicine, pediatrics, and obstetrics–gynecology. Students participate in the activities of community health agencies and organizations such as hospice, home health care, nursing homes, free medical clinics, and public health agencies.
  - Laboratory Medicine, a two-week course, is devoted to small-group discussion and clinical laboratory problem-solving exercises.
  - EKG, which runs concurrently with Laboratory Medicine, teaches students to read EKGs.
  - Subinternship, which can be based in any one of several disciplines, is a one-month experience designed to allow students to function more independently in a clinical environment.
- All student experiences in the community are arranged through the collaborative efforts of the Office of Student Affairs and Curriculum and the Office of Statewide Clinical Education Programs. The latter office coordinates all educational outreach activities for the college of medicine and The University of Iowa Hospitals and Clinics, including those for medical school education, graduate medical education, and continuing medical education. As a consequence, students reap the benefits of a fully integrated educational program in the community.
- The integration of the curriculum within years has been aided significantly by the appointment of curriculum directors for each semester. They are responsible for ensuring coordination across courses. Integration across semesters is aided by a curriculum database, which allows full Web-based searching for faculty who are interested in learning more about what students have learned prior presenting to the class.

Application of Computer Technology

- Students are not required to purchase computers. They do have access to four new computer facilities.
- A new 25-station computer classroom, the Hardin Information Commons, has been completed in the lower level of the Hardin Library as part of a joint venture between the college of medicine and The University of Iowa Library System.
- An equivalent amount of additional computer classroom space in the Hardin Information Commons came on-line for the 1998–99 academic year.
- The January Learning Resource Center located in the Medical Research Center provides an additional 25 stations for student use.
- The Ingram Learning Center provides access to computers.
- ICN links connect and support students educationally and personally when they participate in clinical clerkships at extramural campuses around the state.
- Telemedicine consultation links The University of Iowa Hospitals and Clinics with each of the correctional fa-

cilities around the states. Students are gaining increasing exposure to this method of delivering medical care.

Clinical Experiences

- Students spend a minimum of 28 weeks in ambulatory medicine during the 60 weeks devoted to the required courses (excluding the advanced courses).
- The Generalist Core clerkships all have a component devoted to ambulatory care clinical experiences.
- Medical students who began their clinical clerkships since July 1996 have spent a minimum of ten weeks in community-based clinical sites during the first clinical year, and some spend as many as 24 weeks at community sites.

Curriculum Review Process

- Departmental responsibilities include ensuring appropriate content coverage and coordinating exam scheduling.
- Curriculum Committee responsibilities include collecting faculty and student critiques of curriculum and teaching, analyzing results of critiques, monitoring the quality of teaching, and ensuring appropriate use of curricular formats.
- Curriculum directors report to the Curriculum Committee at the end of each semester, summarizing how the courses went, describing the evaluation procedures within the semester, and proposing changes to address problems identified through those mechanisms.
- The Office of Student Affairs and Curriculum (OSAC) has been conducting focus groups each semester for first-year and second-year medical students. A random sample of students is invited, with each student participating once each semester. Associate and assistant deans, curriculum directors, course directors, and curriculum coordinators are also invited to evaluation lunches. Students complete a written evaluation before attending, and the written comments are shared with the associate dean and/or curriculum directors and with course directors. Individual faculty, curriculum directors, and course directors receive summaries of individual lecture evaluations. These meetings have helped identify inappropriate repetition, scheduling issues, and areas in need of improvement. They enable faculty and students to share common concerns and help faculty to gain an understanding of the structure and content of other courses.
- Using paper-based logs, students keep records of their patient encounters in the community-based primary care clerkship (CBPCC), internal medicine clerkship, and pediatrics clerkship. We are pilot-testing a Web-based log.
- Caduceus, the student medical education organization, forms committees of interested students every year to serve as liaisons with the directors of the courses in the preclinical curriculum. Each liaison committee normally meets with the course director several times during the semester to discuss matters of mutual concern. At the end of the semester each committee prepares a written report that is presented to and discussed with the Medical Education Committee. Copies of these reports are also made available to the Curriculum Committee and the course directors, and are kept on file in the Office of Student Affairs and Curriculum. These reports have been a major source of student feedback for many years.

Learning Communities

- Overview
  A major innovation at Iowa has been the development of a community structure to simultaneously and synergistically manage curriculum and student affairs while responding to the needs of society. Every student is a member of one of four learning communities, each composed of equal numbers of first-, second-, third-, and fourth-year students. Students remain in their designated communities for their entire medical school experience. Each student belongs to a horizontal (first-, second-, third-, fourth-year) group and to a vertical (community) group.
  - As mentioned earlier, learning communities are called CELLS, meaning Communities for Excellence in Learning and Leadership for Society.
  - Formal and informal learning, professional skills acquisition, wellness and service learning projects, and leadership development activities take place within the community setting. Small-group, mentoring, and tutoring relationships both intentionally and serendipitously occur within the community structure.
  - Communities allow students to *connect*—with other medical students at all stages of the curriculum, with faculty, with student affairs staff, and with individuals in the broader, local community.
  - Students who are connected and supported by the community structure learn more efficiently and effectively. They are more likely to reach their potential and will have many opportunities to develop their leadership, interpersonal communication, and other high-level professional skills.
  - Increased staff–student interaction allows for earlier and more effective interventions.

  - Students will recognize their personal responsibility to society.
  - A strong sense of community helps blunt the impersonal edge of technology and the isolation of off-campus clinical experiences.
- The curriculum before the community structure
  - Traditional 2 + 2 basic science/clinical medicine.
  - Classes taught in six different buildings in space often originally designed for research or clinical activities.
  - Students knew or worked with few medical students outside those in their classes.
- The design of the community structure
  - The Medical Education and Research Facility (MERF) is currently under construction and is targeted to open in 2001. MERF will house four student communities in four two-level "pods" designed to facilitate community activities, including delivery of instruction and small-group activities.
  - Each pod contains small-group rooms, examination rooms, study areas, and office space to support the activities of the community.
  - Each community will be staffed by a director, a curriculum/community coordinator, and a secretary.
  - Students are encouraged to initiate and provide leadership for community activities. They are active participants in the development process by responding to surveys, joining advisory groups, and organizing individual community activities.
  - Programming, in addition to the standard curriculum, will include wellness promotion, preparation for current medical practice, service learning, and cultural competency.
- Communities timeline
  - 1999: Students assigned to one of four communities; curriculum/community coordinators hired. Community activities initiated; small groups, tutors, and mentors assigned within community structure.
  - 2000: Faculty advisors and career advising activities added; wellness promotion and service learning projects instituted.
  - 2001: Move into designated community space in new building. Communities become fully operational.
- Evaluation process
  - Formative: Communities leadership group meets regularly to assess progress and plan future activities. Feedback and additional ideas are obtained from a student advisory board. Each student will be surveyed using the same instrument at the beginning of each year to determine progress toward the goals of the community structure.
  - Summative: Outcome measures have been identified and baseline data collected.
- Challenges
  - Integrating service learning and other special programming into the curriculum without overload.
  - Integrating faculty into the community structure.

University of Kansas School of Medicine

GIULIA A. BONAMINIO, PHD, AND ALLEN B. RAWITCH, PHD

Curriculum Management and Governance Structure

- The Education Council establishes policy and provides oversight for the curriculum.
- The Office of the Executive Dean and relevant departments are responsible for implementation of the curriculum.
- The Office of Medical Education, under the direction of the senior associate dean for education and the assistant dean for medical education, assists the Education Council and the faculty in the development, implementation, and evaluation of the curriculum.
- A Curriculum Planning Committee recommended the formation of an Education Council that was approved by the faculty and implemented in 1992. It is a representative body consisting of faculty from courses and clerkships.
- The existing Curriculum Committees on the Kansas City and Wichita campuses were supplanted by three ad hoc committees: the Year 1–2 Curriculum Oversight Committee, the Year 3–4 Curriculum Oversight Committee, and the Introduction to Clinical Medicine (ICM) Committee.
- In 1999, faculty bylaws were changed so that the Year 1–2 and Year 3–4 Curriculum Oversight Committees became standing committees of the Education Council. The ICM Committee continues as an ad-hoc committee.

Office of Education

- The Medical Education Support Unit was established in 1997 with support from the Primary Care Physician Education Initiative, a grant from the Kansas Health Foundation.
- In 1999, the unit became the Office of Medical Education and has grown to seven full-time staff led by the assistant dean for medical education.
- Programs coordinated and conducted by the office include: support for all educational committees, curriculum administration, Introduction to Clinical Medicine courses, the standardized patient program, outreach and interdisciplinary activities, and assessment and evaluation.

Budget to Support Educational Programs

- Currently, budgeting for education programs and other faculty and staff activities is not differentiated.
- An ongoing effort to help define missions and funding sources is currently proceeding in the School of Medicine.

Valuing Teaching

- There are a series of teaching awards sponsored by the medical school and the university, as well as student-driven teaching awards.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The Education Council, in cooperation with the Office of Medical Education, has outlined the outcomes that students must demonstrate prior to graduation in a document entitled "Summative Competencies for Graduates of the University of Kansas School of Medicine." [*It is available from the authors upon request.*]

Changes in Pedagogy

- There has been an increase in the number of small-group experiences since 1990. A variety of small-group methods are used, including problem-based learning.
- Cases are used to introduce concepts to students throughout the four years of the curriculum.
- Standardized patients are used for teaching and assessment and a comprehensive Clinical Skills Assessment will be implemented for fourth-year students in 2001.

Application of Computer Technology

- Students are not required to purchase computers at this time, but computers are available in the Educational Resource Center.

- ◆ Individual courses and clerkships have Web sites, self-paced teaching modules, and listserv/discussion groups.
- ◆ More and more lectures have been moved to computer-based presentations.

Changes in Assessment

- ◆ Changes in the assessment methods include the use of standardized patients and plans for a comprehensive clinical skills assessment for fourth-year students (2001).
- ◆ A digital media database that will facilitate computer-based testing is being developed.
- ◆ Evaluation of grading scales and assessment methods is under way.

Clinical Experiences

- ◆ Clinical experiences available for students include physicians' offices, clinics, wards, nursing homes, community health departments, and social service agencies.
- ◆ Themes for curriculum renewal
    - Development of a competency-based curriculum that clearly identifies knowledge, skills, and attitudes/behaviors required of all medical graduates, independent of subsequent specialty career choice
    - Use of a generalist approach that emphasizes the evaluation of patients with undifferentiated problems
    - Presentation of normal human structure and function and the alterations caused by disease in an integrated, collaborative manner by faculty from basic and clinical sciences
    - Clinical experiences in all four years that reinforce the biomedical sciences and provide the necessary principles of preventive and behavioral medicine, public health, and medical ethics
    - Introduction of students to the role of the physician as a member of an interdisciplinary health care team
    - Use of a variety of teaching methods, including computer-assisted and small-group, case-based instruction, which enhance problem-solving skills and encourage lifelong learning
    - Clinical training that makes increasing use of community and ambulatory settings (a statewide Medical Education Network expands opportunities for training in rural communities)
- ◆ Design for renewal process
    - Revision of faculty governance
    - Education Council created
    - Primary Care Physician Education Grant
    - Year 1–2 Curriculum Oversight Committee
    - Year 3–4 Curriculum Oversight Committee
    - Medical Education Support Unit established, expanded to Office of Medical Education
- ◆ Planning resource needs
    - Faculty time
    - Staff support for Education Council and Curriculum Oversight Committees
    - Travel budget for visitation of other medical schools
    - Visiting consultant expenses
- ◆ Implementation resource needs
    - Faculty time, including community-based physicians
    - Classroom space for small-group teaching
    - Staff support for Education Council and Curriculum Oversight Committees
    - Faculty development workshops
    - Salary and clerical support for Directors of Medical Education Network
    - Faculty salaries, staff support, and budget for new courses
- ◆ Challenges of process
    - Changes in executive leadership
    - Negotiating consensus at all stages
    - Obtaining additional teaching time from already busy faculty
    - Recruiting and training additional community-based faculty
    - Coordinating schedule and classroom usage among preclinical courses
    - Identifying adequate classroom space for increased small-group activity
    - Coordinating, planning, and implementing new curriculum between Kansas City and Wichita campuses
- ◆ Strategies used
    - Grant support for planning and implementation of new curriculum
    - Bicampus meetings by ITV and intercampus flights
    - Establishing the Medical Education Support Unit to provide educational expertise and staff support to faculty and committees
    - Student involvement at all levels
- ◆ Planned evaluation
    - Student evaluation of curriculum
    - Faculty evaluation of curriculum
    - Office of Medical Education evaluation of curriculum
    - Evaluation of student performance
    - USMLE performance
    - Career choices of graduates
    - Residency performance
    - Practice patterns and location

Curriculum Review Process

- Consistent with the charges given to it by the faculty, the Education Council, as part of its oversight responsibility, evaluates courses/clerkships offered by the School of Medicine.
- The purpose of the evaluation process is to improve and integrate all courses/clerkships within the medical school curriculum, to provide information to course/clerkship directors to facilitate ongoing improvement in course offerings, and to assist department chairs and deans in identifying resource needs. Every required course receives at least one type of review each year.
- There are two types of review, ongoing and comprehensive
- Ongoing review is conducted for every required course each year, except when a comprehensive review is to occur; and a comprehensive review is conducted for every required course every third year.
- A comprehensive review may also be conducted for any course with significant changes, any course whose course director(s) request(s) such a review, any course where previous evaluations suggest the need for review of this nature, or when requested by the Education Council or the executive dean.

Future Goals and Challenges

- The major issues that the school is likely to address in the next five years include
    - validation of clinical skills, knowledge, and attitudes via the comprehensive, fourth-year Clinical Skills Assessment;
    - continuing efforts to improve integration; and
    - tracking of graduates into residency and practice.

University of Kentucky College of Medicine

CAROL ELAM, EDD, DONNA GRIGSBY, MD, LOIS MARGARET NORA, MD, JD, AND EMERY WILSON, MD

Curriculum Management and Governance Structure

- The Curriculum Committee is a faculty committee with student representatives that addresses undergraduate medical education issues and monitors the effectiveness of the curriculum. Topics addressed by the committee include review of courses and clerkships (interviews with course director, chair, and students; review of course materials, student performance data, and student evaluations), student affairs issues, course changes, joint programs (MD/PhD, MD/MPH, MD/MBA), and grading and evaluation of student performance.
- The Curriculum Committee is chaired by the associate dean for academic affairs.
- Course directors in years one and two and both third-year course directors and directors of fourth-year rotations meet and discuss curricular issues. The course director groups are responsible for curricular decisions in their respective years.
- In 1990, the University of Kentucky College of Medicine received the Physicians for the Twenty-first Century grant for curricular reform from The Robert Wood Johnson Foundation. In planning the implementation of the grant, the Overview Curriculum Committee was formed. This committee guided the development of new courses and a new curricular structure across all four years of the medical education program at Kentucky.
- During the period of curricular reform, both the Curriculum Committee and the Overview Curriculum Committee were in place. The Curriculum Committee dealt with day-to-day curricular and evaluation issues; the Overview Curriculum Committee dealt with the design and implementation of the revised curriculum.
- After the new curriculum was fully implemented across all four years of the medical education program, the Overview Curriculum Committee was disbanded.

Office of Academic Affairs

- In 1990, a director of the Kentucky Medical Curriculum Office was appointed.
- Four curriculum consultants support the educational program and the faculty. The curriculum consultants are each assigned to several courses or clerkships and provide assistance with logistic support, case writing and revision, preparation of educational materials, Web development, and testing and evaluation.
- The Center for Excellence in Medical Education provides faculty development opportunities, including medical education grand rounds, workshops, and courses on aspects of teaching, evaluation, computer utilization, and grading.

Budget to Support Educational Programs

- Support for the Kentucky Medical Curriculum Office and the Center for Medical Education was initially established through monies provided jointly from the office of the dean and The Robert Wood Johnson Foundation.
- Since the conclusion of the grant period, these units have been funded by the dean of the college of medicine.

Valuing Teaching

- In a joint effort with their department chairs, faculty annually complete Distribution of Effort forms, which outline their faculty responsibilities for the upcoming academic year. Faculty volunteer or are assigned responsibilities as course directors by their chairs.
- To recognize faculty contributions to the educational program of the college, the Office of Academic Affairs sponsors two events, the Educators' Dinner and the Abraham Flexner Master Educator Awards.
- The Educators' Dinner is held annually and is attended by course directors and members of key education committees (Admissions, Curriculum, Student Progress and Promotions) to honor their contributions to the education program.
- The Abraham Flexner Master Educator Awards are presented annually to faculty who have met award criteria for teaching, educational innovation and curriculum development, educational evaluation and research, leadership, and faculty development in education.
- Faculty are referred to as faculty medical educators.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Educational goals and objectives are specified as learning outcomes for each course and clerkship in the curriculum.
- The educational goals and objectives of each course or clerkship are determined by the course and clerkship directors in consultation with the faculty who teach in that course or clerkship.

Changes in Pedagogy

- The curriculum has been revised into a block-style format with intensive study of traditional courses over several weeks rather than several months. Blocks are designed to enhance the integration of the basic and clinical sciences to demonstrate the clinical usefulness and relevance of the sciences basic to medicine in practice situations.
- Patient case-based discussions in small-group settings have been added to several courses in the basic science curriculum.
- Early exposure to clinical medicine in community-based ambulatory care sites is introduced in a week-long experience in the first-year curriculum.
- Two courses, Healthy Human (first year) and Patients, Physicians, and Society (first and second years) have been created using a problem-based learning format.
    - The Healthy Human course addresses health promotion and disease prevention along the human life cycle.
    - Patients, Physicians, and Society provides increased attention to communication skills and the ethical, social, psychological, and financial impacts of disease upon the patient, the family, and society.
- Students serve as peer instructors/tutors to teach gross anatomy (first year) and physical diagnosis skills (first and second years).
- Computer-based instruction occurs throughout the curriculum in Web-based modules, basic science software applications, and patient management simulations.
- Standardized patients are used extensively throughout the curriculum to teach interviewing and physical examination skills.
- During clinical rotations, multidisciplinary seminars and workshops (across medical specialties and other professional disciplines, including law enforcement and social work) supplement patient-care-centered educational activities by addressing societal issues.

Applications of Computer Technology

- Instructional technology is used in the curriculum and students are required to own computers.
- The college provides students with required software, including communication and Internet applications, digital lectures, patient simulations, and access to Web-based learning modules.
- Academic Computing Services staff provide support for students and faculty with consultation on technical issues and curriculum software support.

Changes in Assessment

- Computer-based examinations have been administered in both the pathology and the psychiatry components of the Mechanisms of Disease course (second year) and the Immunity and Infectious Disease course (second year).
- Standardized patients are used to teach and evaluate history-taking and physical examination skills in first and second years.
- Standardized patients are used to evaluate clerkship-specific skills in medicine, pediatrics, and obstetrics–gynecology.
- At the end of the third year, students are evaluated by standardized patients in a 16-station clinical performance examination. The examination is designed to assess core clinical skill competencies of students moving into their final year of medical school.

Clinical Experiences

- First-year students shadow area physicians to learn about the functioning of their practices, noting such aspects as the patient population profile, types of patient care provided, staffing, business practices, and interactions with third-party payers.
- First- and second-year students practice history-taking and physical examination skills with standardized patients. Under the supervision of their preceptors, students perform history taking and examination on hospitalized patients.
- Third- and fourth-year students see both clinical and hospitalized patients at the University Hospital. They

also see patients at affiliated hospitals and clinics throughout the city and state.

- Third- and fourth-year students can participate in clinical clerkship experiences in community-based practices through the Area Health Education Centers.
- A required community-based clinical experience has been incorporated into the primary care clerkship.
- Continuity-of-care experiences have been incorporated into the combined obstetrics and pediatrics clerkship.
- Elective experiences for fourth-year students are arranged in clinics and hospital settings in other states and in other countries.
- Fourth-year students complete a required emergency medicine selective in area emergency rooms. During this rotation period, students complete the requirements to become certified in Advanced Cardiac Life Support.

Curriculum Review Process

- Each course and clerkship in the curriculum is subject to a triennial review, with more frequent focused reviews as needed. A committee composed of members of the Curriculum Committee is charged with reviewing
    - course review questionnaire completed by the course director
    - course syllabi
    - course evaluations completed by students
    - interviews with students who have completed the course/clerkship
    - interviews with course directors and chairs of the involved departments
    - interviews with course faculty
    - review of course grades and student performance on the USMLE in the related discipline
- After the review of all these materials, the committee writes an overall review listing course strengths, areas of concern, and resulting recommendations. This information is shared with the course director, the department chair, and the Curriculum Committee.
- In addition to individual course reviews, the Curriculum Committee will address specific topics that should be covered throughout the curriculum (nutrition, women's health, and evidence-based medicine).
- In enhancing the research mission of the institution, student research opportunities will be identified within the current curricular structure and be made available to students. The Curriculum Committee, in cooperation with course and clerkship director committees, will re-examine the effectiveness of the current curricular structure and identify opportunities for further integration while addressing curricular redundancies and deficiencies.

Future Goals

- Other issues likely to be raised over the next five years include
    - identification and training of future course and clerkship directors (given impetus to generate revenue through research and clinical income)
    - mechanisms to identify and reward faculty who teach in interdisciplinary courses
    - implementing and monitoring curricular improvements based on ongoing program evaluation
    - expansion of the community-based preceptor program
    - continued development of instructional technologies, including computer-assisted instruction and computer-based testing
    - enhancement of service-learning experiences within the medical school curriculum
    - further development of the medical education research program, focusing on evaluation of educational innovations.

University of Louisville School of Medicine

La[illegible]ence Carr, PhD

Curriculum Management and Governance Structure

- The education program at the school of medicine is managed by the Educational Policy Committee, which is chaired by the associate dean for curriculum.
- The committee recommends curricular policies to the Faculty Forum and executive faculty.
- The associate dean for curriculum reports to the vice dean for academic affairs.
- Two faculty members representing each year of the curriculum serve on the committee for three-year terms and meet regularly (monthly for years one and two; semiannually for years three and four) with course and clerkship directors to review curricular concerns and plans and discuss educational outcomes and goals.

Office of Education

- The Office of Curriculum Development and Evaluation is under the direction of the associate dean for curriculum and has three full-time staff.
- Current plans are to expand with additional staff (an educational specialist and a standardized-patient director).

Budget to Support Educational Programs

- Other than monies for staff salaries, the office does not have a discretionary budget for medical education.

Valuing Teaching

- In conjunction with the Office of Continuing Medical Education and the Office of Student Affairs, the Office of Curriculum Development and Evaluation has sponsored a variety of activities and programs to enhance faculty teaching.
- A formal program of faculty development is under study.
- At the present time, there is no separate designation for faculty with primary responsibility for teaching.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school is presently undertaking a comprehensive review of educational objectives with the aim of developing an educational objectives document over the next year.

Changes in Pedagogy

- A few basic science courses have integrated small-group learning experiences (problem-based learning).
- A number of courses have begun to introduce computer-based learning experiences to facilitate independent learning.
- Over the past ten years, several changes in the curriculum have occurred.
- First- and second-year students are given earlier and more extensive exposure to clinical medicine through a two-year longitudinal course (Clinical Practice Sciences). This course integrates biopsychosocial aspects of medicine with an introduction to clinical skills.
- A community preceptorship is now a part of the core curriculum.
- First- and second-year students participate in a standardized-patient program for evaluation of clinical skills proficiency.
- In the third year, the clinical clerkships in internal medicine, family and community medicine, and pediatrics have been integrated into the 24-week Primary Care Clerkship, which comprises equal training at inpatient and outpatient sites, including a four-week rural rotation.
- In the fourth year, a combined neurology–neurosurgery clerkship has been implemented. Students are required to complete three ambulatory rotations selected from a variety of options.
- A limited number of students are able to complete the

entire third and fourth years at an off-campus training center (Trover Clinic in Madisonville, KY).

Application of Computer Technology

- ◆ Students are not currently required to own computers.
- ◆ Computers are playing a greater role in faculty lecture presentations.
- ◆ A limited number of small-group experiences involve computer-based case presentations.
- ◆ Students are able to access the Web pages of selected courses for scheduling and assignments.

Curriculum Review Process

- ◆ The Educational Policy Committee carries out an annual review of all required core courses.
- ◆ The school is in the initial stages of developing the objectives document. It is anticipated that this process will lead to a detailed evaluation of curricular content and outcomes, as well as evaluation methods.
- ◆ The dean is very supportive of this initiative.

Future Goals

- ◆ The major issues that the school will be addressing are:
  - Completing the educational objectives initiative
  - Expanding the use of standardized patients and other methods for evaluating clinical skills
  - Integration of instructional technology into the educational program

Louisiana State University School of Medicine—New Orleans

RICHARD DICARLO, MD, MICHAEL LEVITZKY, PHD, ROBERT MARIER, MD, MHA, AND CHARLES HILTON, MD

Curriculum Management and Governance Structure

- The governance has evolved depending on the stage of the renewal in which the school is engaged.
- Throughout the process the school has maintained a Curriculum Evaluation Committee to monitor and make necessary changes in the current curriculum.
- In the active design phase following a faculty and student retreat, the school adopted the Year 1 Committee for curriculum management and governance. It is composed of
    - the Semester 1 Committee
        - —Course committees
        - —the Science and Practice of Medicine Committee
    - the Semester 2 Committee
        - —Course committees
        - —the Science and Practice of Medicine Committee
    - the Science and Practice of Medicine Committee
    - the Evaluation Committee
    - the Faculty Development Committee
    - the Information Technology Committee

Office of Education

- Established in 2000.

Budget to Support Educational Programs

- Established by the dean from various sources.

Valuing Teaching

- Numerous teaching awards are being given.
- A new teaching award is the most prestigious award in the university system and the only award given to faculty at graduation.
- Faculty may be promoted with tenure if they have substantial academic pursuits in education research.
- A major component of the curriculum renewal will involve faculty development, including a "master teachers" program.

CURRICULUM RENEWAL PROCESS

Before curriculum renewal, there was the traditional pattern of two years of basic science and two years of clinical science. After one year of study the Curriculum Oversight Committee passed 23 goals to guide curriculum renewal. These included, among others

- Integration of basic and clinical sciences over four years
- Beginning clinical experience the first year
- Linking case-based teaching specifically to concurrent basic sciences
- Reviewing and amending lectures for relevance and unnecessary redundancy
- Generating learning objectives for each contact hour, with evaluation closely linked to learning objectives
- Restructuring to assure number and distribution of contact hours are approximately equal to national and regional norms
- Giving administrative support for added responsibilities of faculty resulting from curriculum reform
- Generating a list of clinical competencies for each stage of school with methods to realize this goal
- Developing a system to evaluate curriculum reform
- Recognizing that assessment drives behavior and altering evaluation to enhance the learning to medically relevant material
- Fostering appropriate faculty development, including creation of rewards and incentives for teaching
- Establishing an office of medical education

Learning Outcomes

- A committee is currently at work on this area.

Changes in Pedagogy

- The plan is to move from all lectures to 30–40% small groups with computerized case-based teaching one afternoon each week.

Application of Computer Technology

- Syllabi and various learning materials are available on the Web.
- Computer-based cases will be used weekly.
- Computer-based testing for students is under consideration.
- Students may be required to buy laptops if computer-based testing is instituted.

Changes in Assessment

- Standardized patients are to be used in clinical years for teaching and assessment.

Clinical Experiences

- Every first year student spends one week in his or her own primary care physician's office during winter break.
- Approximately half of the class spends a month in the summer after the first year in a rural primary care practice.
- Six experiences in clinics/hospitals learning history and physical skills during the second year are required.
- In the new curriculum, first- and second-year students will spend at least one afternoon per week in settings such as a community physician's office, community clinics, hospices, adolescent psychiatric facilities, or a procedure lab.

Timeline for Curriculum Renewal

- 1998
  - Director of basic science curriculum
  - New academic dean
  - Broad-based educational program targeting all faculty with many outside speakers, numerous written materials, and data sets
- 1999
  - New coordinator in the Office of Medical Education
  - Curriculum Oversight Committee passes 23 goals
  - Curriculum development creates template for new curriculum
    - —Mornings: basic science
    - —Afternoons: Science and Practice of Medicine
  - Department-by-department information campaign
  - Develop business plan for new curriculum
- 2000
  - New director of clinical curriculum joins the dean's office to develop and administer Science and Practice of Medicine and new Learning Center announced; a total, of 12,000 square feet of existing space renovated for small-group rooms, procedure rooms, simulation rooms, and a computer lab
  - Faculty/student retreat to charge committees to develop specific content
- August 2000: planned opening of renovated Learning Center
- Fall 2000: faculty approve new curriculum for year
- Spring 2001: begin work on second year
- August 2001: initiation of year one of the new curriculum

Curriculum Review Process

- Each course is reviewed every three to four years by curriculum committee.
- Each course is evaluated annually by all students; the extensive data are compiled with reports generated by students from the Aesculapian Society.
- Plans for the evaluation of change
  - Changes in USMLE scores
  - Changes in AAMC Graduation Questionnaire
  - Changes in Aesculapians' evaluation of courses
  - Change in psychological satisfaction profiling of students before and after
  - Student and faculty satisfaction surveys
  - Standardized experiences
  - Assessment of student preparedness to enter clinical years
  - Survey of performance of residents in their residencies

Structure of New Curriculum

- Currently in the process of redesigning each year of the curriculum starting with year one.
- After the Curriculum Oversight Committee developed the goals above, the separate Curriculum Development Committee generated a template for the first two years. In this template, the student's time will be divided as follows: *mornings*—standard basic science lectures and

labs; *three afternoons per week*—The Science and Practice of Medicine, divided as follows:

- *Computer cases:* One afternoon working on computer-based cases that relate directly to the concurrent basic science courses using a modification of a commercially available software package
- *Clinical forums:* Weekly small groups covering a host of topics such as ethics, population-based medicine, the patient–physician relationship, professionalism, epidemiology and evidence-based medicine, and communication skills
- *Clinical experiences:* One afternoon in clinical activities such as
  —targeted clinical activity—H & P skills, adolescent care, end-of-life care, etc.
  —procedures—common procedures, including IVs, lumbar puncture, etc.

Planning Resources Needed

- Support for visitors and information campaign
- More travel funds
- Consultants for both physical structure and curriculum components

Resources Needed

- In the Office of Medical Education, an academic dean; Directors of the basic science and clinical sciences curricula; and coordinators and support personnel
- In the Learning Center, design/construction costs, and equipment (furniture, computers, mannequins, simulators)
- Defined education budget, including faculty stipends for increased small-group teaching, and software for case-based teaching

Strategies Used

- Leadership by the dean
- Large information campaign using what other schools are doing, Medical School Objectives Project reports, course evaluations, data from AAMC Curriculum Directory and Graduation Questionnaire, etc; core message repeated at every opportunity
- Information campaign paced to allow full discussion of points of view
- Preservation of basic science course autonomy
- Identifying, empowering the "educationally influential"
- Widespread student involvement

Challenges

- Finding and directing dollars to the education budget
- Faculty resistance to change
- Faculty resistance to changing promotion guidelines in order to reward teaching
- Pressures on clinical faculty that make it harder to enlist them for more small-group teaching

Louisiana State University School of Medicine in Shreveport

ANDREW L CHESSON JR., MD

Curriculum Management and Governance Structure

- The curriculum is governed by the Medical Curriculum Council (MCC).
- Some members are elected from major faculty governance groups, some by groups of course directors, and some are appointed by the dean.
- An entirely revised charge to the MCC includes central curriculum management and long-term curriculum planning.
- Faculty have approved the MCC to direct the school's curriculum-change process.

Office of Education

- An evolving office of educational support services was established in 1996.
- The office is providing greater support for many curriculum issues such as course evaluations, classroom support, and curriculum committee support.
- Additional staff have been recommended by the MCC to provide stable administrative assistance.

Budget to Support Educational Programs

- There is no defined budget for the educational program.
- Most of the educational program is funded indirectly through support of positions and programs via departments, divisions, or centers of excellence.

Valuing Teaching

- Recognition of faculty teaching efforts is evolving with the curriculum renewal efforts.
- Successful faculty are recognized currently through student, departmental, and institutional awards.
- The Educator's Portfolio, required for Promotion and Tenure Committee action, serves to formally focus on teaching-related responsibilities and accomplishments, including teaching as well on education-related research, publication, and administration activities.

CURRICULUM RENEWAL PROCESS

- The curriculum is undergoing major and substantial revision, with some changes now in place and others in progress.
- A general faculty retreat was held in January 2000 to finalize additional parts of the revision with a three-year graduated implementation schedule.

Learning Outcomes

- Medical school objectives have been identified, voted upon, and agreed to by the faculty.
- Course objectives are correlated to the institutional objectives.
- The evaluation process is under revision.

Changes in Pedagogy

- Small-group learning experiences have increased, in basic science courses particularly, and in some clinical courses.
- Cases are often used, especially computer-based cases.
- Standardized patients are not used for teaching and assessment now, but the use of standardized patients as part of an OSCE is under consideration.

Application of Computer Technology

- All students are required to have laptop computers.
- A computer educational support program provides specific student training in the first week of school, as well as providing faculty training, faculty development, and development of program and teaching aids.

Changes in Assessment

- Computers are used to compile much of the assessment information.
- Faculty observation is a substantial part of assessment and is being strengthened and formalized.
- The use of OSCEs is planned, as well as use of standardized patients as a more uniform assessment method.
- Trained and volunteer patients are used currently in some courses for teaching clinical skills.
- Logbooks have been utilized and are now becoming more standardized across sites.

Clinical Experiences

- Students have clinical experiences in:
    - the hospital
    - subspecialty clinics
    - primary care clinics
    - a student longitudinal clinic (Comprehensive Care Clinic)—a multi-year continuity experience
- Community clinic use will be initiated on a broader scale next year.

Curriculum Review Process

- A major curriculum review and revising process is under way.
- Many faculty committees have been meeting intensely for more than a year, with specific tasks and areas of curriculum renewal to address. These include
    - centralized management of the curriculum
    - changes in the first two years focusing on core knowledge
    - developing systems and disease modules (changed from department-based courses)
    - changes in the clinical years from required junior and senior rotations to third-year required rotations (some of which are longitudinal and multidisciplinary)
    - fourth-year electives and selectives
    - innovative teaching and assessment
    - basic and clinical science integration

Tulane University School of Medicine

N. KEVIN KRANE, MD, AND JAMES J. CORRIGAN JR., MD

Curriculum Management and Governance Structure

- The Curriculum Committee is the central governing body for the curriculum, chaired by the vice dean for academic affairs.
- Three working subcommittees provide a forum for interaction between basic science course directors and clinical science faculty:
  - First-, second-, and third/fourth-year Curriculum Advisory Committees oversee their respective years and are made up of all course directors and several appointed clinical faculty and students.
  - These subcommittees regularly review courses as well as the coordination and integration of material across the entire curriculum.
  - The subcommittees recommend changes to the full Curriculum Committee, which has consistently supported the recommendations.

Office of Education

- The Office of Educational Research and Services was created in 1995.
- The office is directed by a full-time PhD educator.
- The office gained visibility through curriculum development, faculty development, and course evaluation.
- An assistant director has been recruited, and the office currently has five staff members, with further growth anticipated.
- The office has competed successfully for extramural funds that have resulted in the creation of a teaching and learning technology center, educational enhancements that embrace new technologies, and programs that stimulate faculty development.

Budget to Support Educational Programs

- The budget is derived primarily from tuition dollars.
- The school has begun to explore ways in which mission-based budgeting could enhance the allocation of funds for educational programs.

Valuing Teaching

- Course and clerkship directors directly identify faculty who participate in the medical student education program.
- Students recognize outstanding faculty through an organization called the Owl Club—a student liaison organization, created over 70 years ago, that provides systematic student-generated evaluations of all courses.
- Outstanding faculty and courses are recognized at an annual banquet each year.
- A Teaching Scholars Award is given each year based on nomination and selection by peers; the award carries financial and academic recognition.

CURRICULUM RENEWAL PROCESS

- In 1995, the dean led an executive faculty retreat, which emphasized that medical education was of the highest priority and recognized that the following changes needed to occur:
  - Basic and clinical science needed to be integrated throughout all four years. The curriculum was too dense, and greater flexibility was necessary. There were too many lectures and no effective way to either remove outdated material or incorporate new material.
  - Students needed to be active learners.
  - A primary care curriculum was necessary.
  - Since 1995, major curricular revision to achieve these changes has occurred in an evolutionary fashion.

Learning Outcomes

- In 1998 the Curriculum Committee held a retreat to establish learning objectives.
- These objectives were reviewed and endorsed by both the General Medical Faculty and the Executive Faculty.
- Learning outcomes are being established and will be incorporated into the second-year OSCE.

Changes in Pedagogy

- There is movement either to coordinate curriculum content across disciplines or to integrate the material completely.

- There is an organ-based multidisciplinary course throughout the second half of the second year; pathology and pathophysiology are taught and evaluated as one course.
- In the clinical years, a required interdisciplinary fourth-year selective is being developed in ambulatory medicine.
- Since 1990 there has been a dramatic increase in the number of small-group learning experiences throughout the curriculum, often using cases to focus students on specific applications of basic science principles to clinical medicine.
- Cases are used routinely in lecture courses to illustrate concepts; there are fewer lectures and a more active learning experience.
- Standardized patients are used extensively throughout the curriculum.
- Standardized patients are used to teach medical interviewing, focused and complete physical examinations, breast and pelvic examinations, prostate examinations, and topics such as death and dying.

Application of Computer Technology

- Students are not required to have computers, but a computer lab is available 24 hours a day.
- All classrooms have ethernet access, and the two major lecture halls have been outfitted with complete multimedia presentation technology for both Mac and PC platforms.
- Computer technology is playing a larger role, for both teaching and learning.
- Faculty are putting teaching materials on Web sites or supplementing teaching material with additional case-presentation material and learning exercises.
- The school has been involved in creating "virtual PBL" or on-line clinical cases for small-group discussion.

Changes in Assessment

- A ten-station OSCE, using standardized patients, that incorporates both clinical skills and fundamental knowledge from pathophysiology is given at the end of the second year. This examination will be used to establish learning outcomes for the end of the second year.
- All students must successfully complete a fourth-year OSCE.
- When the National Board of Medical Examiners (NBME) implements the clinical skills examination for licensing, the use of OSCEs will be incorporated into the clinical clerkships.

Clinical Experiences

- Students begin clinical experiences in the first year with monthly outpatient visits with a primary care physician, focused on medical interviewing.
- The family practice clerkship offers an eight-week ambulatory experience with a community preceptor.
- Students spend variable amounts of time during pediatrics, obstetrics, and surgical clerkships in outpatient settings.
- Fourth-year programs are evolving. Tulane students spend up to eight weeks in outpatient medicine and/or pediatrics during their fourth year and complete a community medicine seminar series.
- A new interdisciplinary fourth-year selective will replace these existing fourth-year experiences.
- At the present time, a small group of third-year students participate in an educational research and demonstration project that is a longitudinal community-based experience, teamed with an internal medicine resident. This group of eight students travels to the same community physician's office and participates in a didactic ambulatory curriculum for the entire third year.

Curriculum Review Process

- A multifaceted process is used for review of the curriculum, though no new process has been implemented.
- The Curriculum Committee has established objectives for the curriculum. Changes are evaluated using the assessment methods previously in use at the school, which include
    - annual and in-depth course reviews
    - student Owl Club reports
    - AAMC graduation questionnaire
    - USMLE scores
    - specific surveys developed by the Office of Educational Research and Services
- These methods provide an ongoing review of educational programs.
- Faculty from other departments in the curriculum subcommittees review all student Owl Club evaluations and annual reports.
- Concerns are addressed directly with the course directors, and plans for improvement are monitored.

- The most significant change in an evaluation tool that is likely to occur over the next several years will be the movement of the OSCE examination into the clinical clerkships in the third year and a more formal end-of-second-year evaluation, using the current second-year OSCE examination.
- The provision of more integrated examinations with larger banks of questions developed in an interdisciplinary manner and delivered on-line is being investigated.
- Significant infrastructure support will be necessary for faculty development to develop validated clinical vignette questions, and additional faculty time will be necessary for interdisciplinary assessment.

Future Goals

- The major issues the school is likely to address in evaluating the education process over the next five years are
    - development of formal learning objectives
    - more effective validation of course examinations, with multidisciplinary question banks
    - assessment of learning outcomes using OSCEs
    - both on-line course examinations and student assessment of courses
    - continued interdisciplinary integration of basic and clinical sciences
    - utilization of Curr-Mit for curricular revision

The Johns Hopkins University School of Medicine

JOHN SHATZER, PHD

Curriculum Management and Governance Structure

- Over the past ten years, the educational program has been overseen by the vice dean of academic affairs, recently changed to the vice dean of education.
- The vice dean of education chairs the Educational Policy Committee, where all policies and procedures of the educational program are reviewed and approved before being sent to the School Advisory Board for final approval.
- Each phase of the educational program has a curriculum committee that initiates revision to its respective curriculum. There are committees for year one, year two, and the clinical years.

Office of Education

- An Office of Medical Education Services was established in October 1991.
- The office is staffed by a director, who has a PhD in education, and a secretary.
- The office has grown over the past decade to include a Clinical Education Center that supports the use of standardized patients. The center employs two trainers.
- The office is currently considering the need for a dedicated faculty development position.

Budget to Support Educational Programs

- Much of the change process that the school went through was funded in part by The Robert Wood Johnson (RWJ) Foundation. The budget from that grant was not sustained when the funding ended in 1997, although there is a "new curriculum" budget that funds the centrally run curricular components and a portion of the salary lines for the offices of Medical Informatics Education and Medical Education Services.
- The funds are allocated from the dean's office general funds.

Valuing Teaching

- There is no separate pathway to promotion and tenure for faculty who chose to develop their careers in educational scholarship or hold primary responsibility in the medical school program.
- Faculty are rewarded through traditional teaching awards, at both the school and the department level.
- Strategic planning is under way to implement a schoolwide teaching faculty development program to include full- and part-time faculty and house officers.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school uses a set of 11 objectives (listed below the mission statement) to guide measuring student outcomes. These were compiled by the Office of Medical Education Services and reviewed, modified, and approved by the Educational Policy Committee.
- The mission of The Johns Hopkins School of Medicine is to prepare physicians to practice compassionate clinical medicine of the highest standard and to identify and solve fundamental questions about the mechanisms, prevention, and treatment of disease, in health care delivery or in the basic sciences. As a measure of his or her competence, every graduate of The Johns Hopkins University School of Medicine will:
  - The science and practice of medicine
    - —Understand and apply the scientific basis of medicine to the diagnosis, treatment, and prevention of disease and to the study of the causes and solutions of medical problems.
    - —Demonstrate a thorough knowledge of the basic sciences and their relationships to the practice of medicine and medical research.
  - Clinical competence
    - —Obtain a sufficient level of medical knowledge to understand the basic facts, concepts, and principles essential to competent medical practice.
    - —Exhibit the highest level of effective and efficient performance in data gathering, organization, and interpretation in clinical decision making in the prevention, diagnosis, and management of disease.
  - Communication
    - —Demonstrate effective and compassionate interpersonal communication skills toward patients and

    families necessary to provide and sustain effective medical care.
    - —Present information and ideas in an organized and clear manner to educate or inform patients, families, colleagues, and the community.
  - Professionalism
    - —Display the personal attributes of compassion, honesty, and integrity in relationships with patients, families, and the medical community.
    - —Adhere to the highest ethical standards of judgment and conduct as they apply to the health care milieu.
    - —Demonstrate a critical self-appraisal in his or her knowledge and practice of medicine, as well as receive and give constructive appraisal to/from patients, families, colleagues, and other health care professionals.
  - Lifelong learning
    - —Understand the limits of personal knowledge and experience and demonstrate the intellectual curiosity to actively pursue the acquisition of new knowledge and skills necessary to refine and improve his or her medical practice or to contribute to the scientific body of medical knowledge.
  - The social context of medicine
    - —Understand and respond to those factors that influence health, disease and medical care that are outside the biological context of medicine.
- These objectives are used as reference points for some part of the formal assessment process. However there is no standardized mechanism, either proactive or otherwise, to ensure that each student meets a minimum competency in each area.

Changes in Pedagogy

- The school introduced several new pedagogic changes during the RWJ initiative that have been sustained and improved.
- Small-group case-based learning has been introduced in both the first and the second years, while decreasing the number of lecture hours to two per day.
- Small groups are used in a four-year streamer curriculum called The Physician and Society.
- Standardized patients have been introduced as teaching tools in the second year.

Application of Computer Technology

- The school has not adopted a policy of requiring all students to own computers. Such a requirement necessitates a better infrastructure to support such computer use. There is also a concern about increasing student debt with such a requirement.
- The Office of Medical Informatics Education was created in January 1992.
- The office carries the majority of responsibility for the educational use of computer technology and for the informatics curriculum.
- Projects include the curriculum Web site tutorial applications, as well as informatics requirements for specific courses.

Changes in Assessment

- Standardized patients are utilized in the third and fourth years as a post-clerkship assessment tool.
- Faculty review videotapes from standardized patient examinations.
- Students are directly observed 2:1 with a preceptor within the physical diagnosis program which extends over the entire second year.

Clinical Experiences

- Students enjoy tremendous flexibility in their clinical experiences. There is no policy to require students to complete core clerkships during their third year (although this is now being scrutinized at the Educational Policy Committee level), so students may begin immediately to select experiences in areas that most interest them.
- Students often defer their graduation dates to complete advanced studies in other disciplines, typically the MPH, or to concentrate on a clinical or bench research topic with a mentor (these are not MD/PhD students).
- The full range of clinical sites is available to students, including tertiary care, primary care, outpatient setting, community health sites, and rural health sites.

Curriculum Review Process

- There is no formal mechanism in place for review of the curriculum other than what is done by the Educational Policy Committee.

University of Maryland School of Medicine

David Mallott, MD

Curriculum Management and Governance Structure

- The Curriculum Coordinating Committee (CCC) has retained the overall governance of the new curriculum, with subcommittees for year one, year two, and the clinical years.
- Evaluations by the students, peer review, review of performances on standardized tests, results of the match, and concerns of the dean are addressed by the CCC, with any change to the curriculum authorized by that group.
- The CCC is composed primarily of course masters and career teachers rather than department chairs.

Office of Education

- The Office of Medical Education was established in the 1970s.
- The office responsibilities have been expanded with the addition of electronic technology to include manager of the laptop help desk, manager of the Web site [Medscope] that supports the curriculum, and, in partnership with faculty, developer of software.

Valuing Teaching

- The School of Medicine has instituted mission-based management.
- The measurement of faculty teaching effort, especially with the emphasis on increased small-group teaching, will be the next challenge.

CURRICULUM RENEWAL PROCESS

- In 1994, the University of Maryland School of Medicine instituted a major change in the curriculum. This was due in part to criticism from the LCME and largely due to concerns of those faculty most identified with the teaching effort that change was long overdue. With the prodding of a new dean, several major changes were planned.

Learning Outcomes

- The curricular change originated from an educational retreat that combined chairmen and major teaching faculty in framing overall goals. Ad hoc committees looked at a variety of processes (evaluation, faculty development, year one, etc.) while reporting to the CCC, the major committee devoted to curricular management.
- The new curriculum was implemented stepwise starting with the class of 1998.

Changes in Pedagogy

- There has been a radical reduction in contact hours, especially lecture hours.
- There has been an increase in small-group teaching throughout the first two years including a small PBL component focusing on how to research and present relevant information.
- A required third-year ambulatory clerkship in family medicine has been added to the curriculum.
- There has been a change from departmental courses to interdisciplinary blocks throughout the first two years.
- The students have strongly supported having only one course with a single exam schedule.
- Morning sessions consist of two hours of lecture and two hours of small group, lab, or other structured exercises.
- All clerkships have significant ambulatory components, leaving the challenges of supervision and quality control as education becomes more dispersed.
- Standardized patients were added as part of the year-one Introduction to Clinical Practice.
- Problem-based learning serves to augment medical concepts and language in the first year while focusing increased attention on ethical problems in the second year.

Application of Computer Technology

- Every student is required to purchase a laptop computer in order to access a Web site developed to support the curriculum across all four years of medical school.
- An informatics course is part of the required curriculum.
- The laptop computers are increasingly being used for ad-

ministration of the courses and evaluation of the clinical experience.

- The laptop computers are being used as automatic logbooks to allow more active management of students' experiences by the clerkship directors.
- Students have the ability to download the lectures to their laptops on the same day as the lectures are given.
- Slides from the lectures are scanned and added to the Web site.
- The Office of Medical Education budget has been increased by the dean, whose vision has driven the curriculum to include the cutting edge of educational technology.
- The computer lab experience includes a variety of learning activities in an electronic multidisciplinary lab that can accommodate 180 laptop computers running asynchronously so that software, both purchased and homegrown, can augment any of the courses in a structured faculty-driven manner.

Changes in Assessment

- Space is currently being renovated at the University of Maryland School of Nursing to run a joint OSCE program to support both medical and nursing students.

Uniformed Services University of the Health Sciences F. Edward Hébert School of Medicine

DONNA WAECHTER, PHD

Curriculum Management and Governance Structure

- Oversight of the curriculum is by the dean's office.
- Policy issues are reviewed and considered by a standing curriculum committee that guides the current renewal process.
- The curriculum committee reports directly to the dean.
- Phase I
  - A steering committee and four subcommittees were established. The four subcommittees were: (1) History of Medical Education in the United States; (2) Current Experiments in Curricular Reform; (3) Curriculum at USUHS-SOM; and (4) Professional Requirements and Outcomes.
  - Subcommittee reports and recommendations were produced and reviewed by the faculty.
  - The dean's office and the relevant academic departments were charged to implement the recommendations.
- Phase II
  - A steering committee and five subcommittees were established. The subcommittees were: (1) Objectives/Goals; (2) Organizational Template/Curriculum Management; (3) Basic Science/Intradepartmental and Clinical Integration; (4) Clinical Clerkships Required/Elective; and (5) Outcomes/Evaluation.
  - Topic groups were established and the subcommittee and topic group reports and recommendations were reviewed by the steering committee, relevant academic departments, and the dean.
  - A consensus was reached on the recommendations and the plans for their implementation.
  - The recommendations were implemented.
- Phase III
  - The curriculum committee provides oversight for the planning process. The areas of focus for this phase include interdisciplinary teaching, academic computing, faculty development, and outcomes assessment.
  - The planning resources needed include travel budget, photocopying, faculty time, and clerical/secretarial support.
  - The implementation resources needed include faculty time, clerical/secretarial support, photocopying, and Computer Center staff time.

CURRICULUM RENEWAL PROCESS

Themes for Curriculum Renewal

- To increase the integration of basic and clinical science content across the four-year curriculum. (The curriculum before the renewal was a traditional "2 + 2" basic science/clinical medicine program.)
- To increase student involvement in and excitement about the learning process.
- To further integrate military medicine topics into the general curriculum.

Curriculum Renewal Timeline

- 1993–95: Phase I planning and recommendations
- 1996: implementation of Phase I recommendations
- 1996–97: Phase II planning and recommendations
- 1998: implementation of Phase II recommendations
- 1998–present: Phase III planning and recommendations
- Academic year 2000–2001: implementation of Phase III recommendations projected to begin

Challenges to the Process

- The school has encountered some expected and some unanticipated challenges during the curricular renewal process. These include
  - concerns/anxiety about change
  - additional workload for faculty and staff
  - establishing and maintaining communication
  - reaching consensus on what to change and how to change it
- The strategies used in the process include:

- town meetings held by the dean of the school
- use of the university Web site to distribute information/raise issues
- involving representatives from all academic departments
- departmental surveys
- establishment of topic groups to review curriculum content
- student involvement at all levels

Curriculum Review Process

- Student evaluations of the curriculum are reviewed throughout the program.
- Faculty evaluations of the curriculum are reviewed.
- Student knowledge, attitudes, and skills are assessed using standardized measures and internal measures (e.g., USMLE, NBME subject exams, OSCE, AAMC Graduation Questionnaire).

Boston University School of Medicine

ARTHUR J. CULBERT, PHD

Curriculum Management and Governance Structure

- The Curriculum Committee is chaired by the associate dean for academic affairs and meets quarterly to deliberate on reports from the Office of Medical Education, from the student representatives, and from subcommittees that are appointed from time to time to consider specific issues or problems.
- The subcommittees may recommend action either through existing administrative offices or through faculty deliberation at regular faculty meetings.
- The course managers of the courses of each year meet periodically with the director and associate director of the Office of Medical Education to compare and coordinate the contents of their courses. They also review plans and potential changes, including those for which scheduling alterations are necessary.

Office of Education

- In 1992, the Office of Medical Education was formed. It is responsible for
    - systematic evaluation of the curriculum with regular feedback to the departments and faculty through the Curriculum Committee
    - operation of the newly designed problem-based learning course, Integrated Problems
    - regular planning, integration, and coordination among departmentally based courses

Student Advising

- Student advising has become a more organized and directed effort through the use of the MedCAREERS program.
- Individual student–faculty relationships are developed from the first semester, built around anticipated student needs to plan for the future. As students progress through school, they engage in a planning process that allows them to develop realistic career goals and to build appropriate personal portfolios.

CURRICULUM RENEWAL PROCESS

- The curriculum before renewal was a traditional 2 + 2 basic science/clinical curriculum with a largely elective fourth year. Goals of curriculum renewal included
    - integration of subject material
    - greater coordination among preclinical courses and between preclinical and clinical courses
    - reduction of lecture hours; no more than three hours of lectures per day
    - small-group sessions, independent study, computer-assisted instruction, and other non-lecture teaching formats to be emphasized
    - restructuring of student evaluation; development of greater uniformity in evaluation methods and greater clarity in evaluation criteria
    - inclusion of observations of student behavior and participation in evaluation processes throughout the curriculum
    - introduction of problem-based learning as a continuum through the first two years
    - supervised patient contact from the start of classes in the first year
    - development of a strong outpatient clinical experience in primary care
    - creation of continuity in the clinical experiences throughout the first three years
    - addition of neurology and radiology to the required clerkships
    - reinforcement of the curriculum planning and curriculum evaluation process
    - re-creation of a longitudinal student advisory system

Changes in Pedagogy

- Two courses, Integrated Problems (IP) and Introduction to Clinical Medicine (ICM), are produced longitudinally throughout the first two years of the curriculum. They serve as a means of relating the basic sciences to each other and of making the transition to the clinical years.
    - Integrated Problems is conducted in a small-group, problem-based learning format. It is a student-centered course in which student participation, cooperative group learning, problem solving, and integration

of information from concurrent courses are primary features.

- Introduction to Clinical Medicine is based predominantly in primary care settings where student to faculty ratios are as small as 1:1. In the first year, the students explore both the various aspects of the doctor–patient relationship and the relationship of medicine to some of the broader social issues of our time. In the second year of ICM, communication skills are reinforced using standardized patients, and techniques of physical examination are introduced.

Application of Computer Technology

- The medical campus library has made an extensive investment in computers that provide the ready availability of database searches, full-text on-line journals, and general applications.
- Students who have their own computers can easily access these services from home and from ports in various locations around the school.
- There is an ongoing effort to place curricular material on the Internet.
- Every student is supplied with an e mail account that now provides the primary means of communication between students and faculty.

Clinical Experiences

- A longitudinal experience, the Community Partnerships Program, which begins in the first year and extends through the clerkships in the third year, is available to those students who select it.
- The program is based in several affiliated community health centers. A student in the program will complete portions of his or her IP course, ICM course and clerkships (family medicine, internal medicine, and pediatrics) in the same health center.
- The student in the program consequently participates in patient care that is continuous over the three-year period, and additionally has the advantage of being precepted by a faculty and staff who can tailor the experience to the student's needs.

Harvard Medical School

DANIEL D. FEDERMAN, MD

Curriculum Management and Governance Structure

- Principal responsibility for the curriculum resides with a Council of Masters of the five Academic Societies, the dean for medical education, and the dean of the faculty.
- In the past two years, this group has expanded to include a Curriculum Committee that includes senior department chairs.

Office of Education

- The Office of Educational Development (OED) was established in 1985 as a component of the New Pathway program piloted that year.
- Since 1990, the group has developed a national and international program for physician–educators and leaders with support from the Macy Foundation; developed educational programs for international affiliates of Harvard Medical School; expanded faculty development efforts in the clinical years; introduced a resident as teacher program in the departments of pediatrics and medicine; created a curriculum database and a Web site; and designed and implemented an end-of-course OSCE and a school-wide comprehensive exam.

Budget to Support Educational Programs

- A discrete budget for the Program in Medical Education has existed since the late 1980s.
- The budget includes administrative support, faculty compensation, and support for the Academic Societies, an Office for Educational Resources, and the OED.
- The budget includes support for student affairs, financial aid, the registrar, and admissions.
- The dean's office provided the funding for the budget.

Valuing Teaching

- The Academic Societies each have core faculty identified because of their commitment to medical student education.
- The promotion mechanisms of the school recognize those who make outstanding contributions to teaching. This applies to individuals who have run clerkships or held other major responsibilities for more than ten years even though they have not published significantly.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Each course has published objectives for the students and a final examination. These are not yet criterion-based.

Changes in Pedagogy

- Small-group learning experience has been in place since 1985 for a pilot group and since 1987 for all students (except those in the Harvard/MIT program).
- Problem-based learning with tutorial groups of eight plus one faculty member is standard.
- Standardized patients are used for teaching and assessment at the end of the Patient/Doctor course in the first, second, and third years.

Application of Computer Technology

- Students are not required to have computers, but the school has provided extensive computer availability.
- Computer technology is involved throughout the curriculum.
- The basic science and pathophysiology course materials and syllabi of the first two years are approximately 80% digitized.
- Students have access to all course material from local area network computers.
- Approximately half of the courses use innovative Web pages for direct contact between faculty and students.
- Within the past two years, special funding for informa-

tion technology initiatives in the clerkships have been introduced.

- Within two years all clerkships will have a Web site common to the various hospitals within the discipline.

Changes in Assessment

- An OSCE at the end of the second year and a comprehensive examination in the summer of the fourth year also measure student achievement.

Clinical Experiences

- Clinical clerkship experiences are available in the 14 hospitals affiliated with the school.
- Students have experiences in a health maintenance organization (Harvard Vanguard Medical Associates).
- Students have ambulatory and primary care experiences in physicians' offices throughout eastern New England.
- Family medicine experiences are available to students in the primary care clerkship.

Curriculum Review Process

- The curriculum is under constant review, usually at the level of the individual course. The reviews are the responsibility of the Academic Societies and an Office for Assessment within the OED.
- Student assessments are used to measure success of educational interventions, but this is not a satisfactory method.

Future Challenges

- The Human Genome Project as a proxy for advances in basic science.
- Information technology for both medical education and practice.
- The moral setting of medicine within which students learn.
- The extensive progress in technology underlying medicine.
- Managed care and the current pressures on providing medical student clerkships.

University of Massachusetts Medical School

MICHELE PUGNAIRE, MD

Curriculum Management and Governance Structure

- Since 1991, the University of Massachusetts Medical School (which includes the school of medicine, graduate school of nursing, and graduate school of biomedical sciences) has made significant changes in its administration and governance.
- Several senior positions were changed.
    - In 1991, the roles of chancellor of the three-school campus and dean of the school of medicine were combined into a single position.
    - In 1995, the position of provost was replaced with vice chancellor for faculty affairs. This position focuses on issues of faculty promotion, tenure, gender issues, and career development.
    - In 1999, the position of director of Office of Research was established to oversee the research enterprises of all three schools (school of medicine, graduate school of biomedical science, and graduate school of nursing). The Office of Research coordinates and administers all departmental research, oversees the Office of Technology Transfer, provides guidance in the hiring of research faculty and mentorship to research-oriented faculty, and leads interdepartmental research efforts.
- The governance structure for education was changed.
    - Prior to 1994, decisions by the Educational Policy Committee (EPC) required approval by the Faculty Council and the Executive Council (which included all department chairs).
    - With approval of department chairs and the university Board of Trustees, the schools' governance document was revised to authorize the EPC to "become the primary governing body of the Medical School . . . (with) authority to determine policy for medical education (including) planning, implementing, supervising, evaluating and continuously revising a coherent and comprehensive program of general medical education for the training of physicians." The EPC reports directly to the vice dean for medical education and the dean of the school of medicine.
- The most recent changes involve governance of the clinical enterprise.
    - In April 1998, the clinical operations of the medical school merged with Memorial Health Care, creating a larger clinical system, UMass Memorial Health Care, structured as a nonprofit corporate entity separate from the university. While this gives the clinical system greater independence, the principles of the relationship outlined in the Definitive Agreement for the new organization include the concept that the academic system and the clinical system will continue to share in "linked destinies," whereby the academic system will continue to support the operation and reputation of the clinical system and the clinical system will continue to support the operation and reputation of the academic system.
    - The governance of the new entity also includes representation from the medical school on its board of trustees, including the chancellor. Additionally, the academic department chairs and division directors of the academic system serve as the department chairs and division directors of the corresponding clinical departments of the clinical system and are appointed by the chancellor with the advice and consent of the president/chief executive officer of UMass Memorial.
    - The merger's "linked destinies" arrangement maintains the autonomy of the medical school to direct and manage its academic mission. Although the school benefits from the reputation and support provided by the clinical system, the academic system is responsible for defining its educational mission and administering its educational programs.
    - The administration, content, structure, and evaluation of the undergraduate medical education curriculum and related programs remain intact.
    - Any refinements or modifications in educational programs since the merger have been driven by the academic priorities and needs of the medical school.

Office of Medical Education

- In 1994, the position of vice dean for medical education with an Office of Medical Education (OME) was established to oversee undergraduate medical education. The positions of associate dean for student affairs and associate dean for admissions report to the vice dean for medical education.
- The OME serves to promote the institution's educational

mission and ensure outstanding quality and nationally recognized stature of its educational programs.

- The OME provides expertise, service, and resources in the following areas:
    - In the past decade, the OME's role in curriculum development and implementation has steadily grown, particularly in interdisciplinary programs. The OME is responsible for administering interdisciplinary courses and educational programs including the Physician, Patient, and Society course, physical diagnosis, and an interclerkship program.
    - Through its Division of Research and Evaluation, the OME has played a greater role in both learner assessment and program evaluation.
    - In 1995, the Division became responsible for administration of a standardized and centralized system for all course and clerkship evaluations by students.
    - In 1995, an End of Third Year Assessment (multistation OSCE) was instituted for all students. At this time, the assessment outcomes are used for formative feedback to students and course directors. (Performance on the End of Third Year Assessment is not used to determine advancement into the fourth year.)
    - The OME oversees the standardized-patent program, which has been increasingly used as a resource for teaching and evaluation of students. Standardized patients have served as an educational resource for medical interviewing and physical diagnosis since 1994.
    - Through the Division of Educational Computing, the OME has promoted increased use of electronic technology in support of teaching.
        - —Since 1994, technology-based applications have been developed for courses in anatomy, histology, and neuroanatomy.
        - —In 1997, the development of a Web-based electronic database was initiated, and it continues to be under development.
        - —In 1998, a system for Web-based electronic course evaluations was implemented for student evaluations of third- and fourth-year clerkships and electives.
        - —In 1999, a Web-based course schedule and school calendar was developed and implemented for years one and two of the curriculum.
        - —In 1999, a system for Web-based electronic course evaluations was implemented for students' evaluations of first- and second-year courses.
    - Through the Division of Faculty Development, the OME has augmented the number and quality of faculty development programs it has sponsored and conducted in collaboration with the Office of Faculty Affairs and the Institute for Community-Based Faculty Development.
    - The Office of Ethics was established in 1992 with a full time ethicist and two support staff. With the creation of the OME in 1994, that office was incorporated into the OME, and it has been a key resource for ethics teaching in educational programs across all departments and all four years of medical school.
    - Through the collaborative support of the Robert Wood Johnson Generalist Physician Initiative, the medical school supported a part-time director of community-based education to coordinate the development and support of community-based volunteer faculty. Since 1995, this position has enhanced CBE through:
        - —the establishment of the Community-Based Education Board (1996)
        - —collaboration in the revision of the Academic Personnel Policy to enhance the appointment process for community-based faculty through the creation of a new appointment track for community-based educators
        - —the development of incentives to promote teaching by community physicians (awards, CME opportunity, honoraria, library access, faculty development and outreach programs)

Budget to Support Educational Programs

- The OME oversees a centralized budget that supports key faculty, curriculum development, and evaluation.
- The school provides a distinct budget to support medical student education, derived from two sources:
    - Funds from the state appropriation allocated by the dean to individual departments to support undergraduate medical education
    - Institutional funds allocated by the dean to the vice dean for medical education to support the OME facilities and personnel, OME-sponsored programs, and faculty assuming major educational roles (e.g., EPC officers)

Valuing Teaching

- Formal faculty development programs are sponsored by the medical school through three entities:
    - The Office of Medical Education, through its Division of Faculty Development, focuses on the development of faculty skills in pedagogy and curricular development (established 1995).
    - The Office of Faculty Affairs focuses on the issues of

faculty promotion and tenure, and career and professional development (established 1995).

- The Institute for Community-Based Faculty Development is a multidisciplinary collaboration among three departments (family medicine, pediatrics, and internal medicine) and the OME, which provides teacher training for full-time and volunteer faculty who teach in the primary care, ambulatory setting (established 1995).

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- A master plan entitled "Goals and Objectives in Medical Education" was developed through a faculty retreat in 1992 and approved by the university's Board of Trustees.
- The document describes the medical school's goal of training physicians in all specialties, with an emphasis in primary care, and contains 20 objectives, divided into three sections on knowledge, skills and competencies, and values/personal attitudes. (A copy of the objectives is available from the author.)

Changes in Pedagogy

- The first and third years of a new, revised curriculum were introduced in 1995, with years two and four phased in the next year.
- The educational strategies employed in driving this process of curricular reform included:
    - A focus on interdisciplinary curricular development and implementation, combining content and faculty from a wide range of departments and disciplines (ethics, social sciences, behavioral science, nursing, and allied health professions)
    - Improved linkages between courses that integrate content of courses being taught concurrently (horizontal integration) and during other phases of the curriculum (vertical integration)
    - Additional problem solving and increased use of small-group teaching formats that address clinical decision analysis, critical thinking, group learning, synthesis of information, and written and oral communication skills
    - Additional independent study and active learning, decompressing the first two years of the curriculum and allowing more unscheduled class time to pursue active learning in small groups, independent study projects, and computer-assisted learning
    - Enhanced flexibility in the curriculum, which allows for the introduction of new content and disciplines such as bioethics, preventive medicine, domestic violence, managed care, cross-cultural competency, end-of-life care, and substance abuse
    - Establishment of a defined core curricular program for each required clinical clerkship
    - Increased exposure to ambulatory medicine, which has resulted in more ambulatory time in the clerkships (four weeks in surgery, six weeks in family medicine, four weeks in internal medicine, three weeks in pediatrics)
    - Enhanced continuity-of-care experiences as the school has expanded the longitudinal preceptorship program from one year to two years
    - The requirement of each clerkship to use standardized patients for teaching and for assessing students' performances.

Application of Computer Technology

- Students are not required to own computers.
- Computer-based technology is being applied in the educational program in a variety of ways:
    - Web-based educational materials and learning modules have been developed to supplement a number of preclerkship and clerkship courses through:
        —digitized versions of local image collections in anatomy, histology, and neuroanatomy
        —interactive Web-based learning modules in neuroanatomy, family medicine, and neoplasia
        —course syllabi, notes, and banks of exam questions in pharmacology, neoplasia, and the family medicine clerkship
    - The medical school library works closely with the EPC, course directors, and the OME in providing instruction in computer use, e-mail, Web browsing and Internet applications, bibliographic searches, and data searches for evidence-based medicine.
    - Web-based applications support educational administration through:
        —course evaluations for all required courses
        —course schedules and calendars for years one and two
        —ongoing development of an electronic curriculum database

Changes in Assessment

- Consistent with curricular objectives, assessment of student competency has been developed and expanded.
- Alternative methods of student performance assessment include essays, short papers, case studies, take-home exams, OSCEs, and other forms of clinical performance-based assessments, in addition to traditional multiple-choice exams.
- Since 1995, the End of Third Year Assessment has been a requirement for all students upon completion of year three.

Curriculum Review Process

- Annually, the OME compiles all course evaluations completed by students. These course evaluations are administered by the individual courses and analyzed centrally by the OME.
- Evaluation forms have been designed in a consistent format, addressing specific course components that include curricular elements, quality of teaching by faculty/preceptors/residents, program administration, and attainment of learning objectives. This format thereby allows comparisons and contrasts across programs, teaching sites, and departments.
- These evaluation outcomes are made available to course directors, department chairs, curriculum committee leaders, and the vice dean for medical education.
- Outcomes are used to monitor educational quality and to direct curricular change through the EPC and curriculum committees.
- The vice dean for medical education reviews these data in order to make funding recommendations to the dean.
- The OME compiles and analyzes data from other sources and provides this information to the EPC, its curriculum subcommittees, and the vice dean. These data include outcomes from the AAMC's Graduation Questionnaire, the End of Third Year Assessment, and performances on the USMLE Step 1 and Step 2.
- In 1992, global revision of the medical school curriculum was initiated, and by the end of the 1996–97 academic year, the implementation of major revisions had been completed across all four years. Ongoing curricular revision continues to take place in response to evaluation outcomes and changing curricular needs.
- The process involved collaboration among over 150 faculty and students.
- Resources required to accomplish the curriculum renewal included:
  - —OME resources, as detailed previously
  - —funding through institutional support from the dean's office, supplemented by a Robert Wood Johnson Generalist Physician Grant Award (1994)
  - —advocacy and support from the dean and faculty leadership
- The barriers to curricular renewal include:
  - —skepticism about the value and role of primary care disciplines in education
  - —competition for curriculum time among departments and disciplines
  - —department- or discipline-specific entrenchment inhibiting collaboration and interdisciplinary program development
  - —resistance to change
  - —faculty time constraints limiting availability for meetings and education planning

Future Goals

- Develop learning objectives and competencies in the area of information technology.
- Develop and implement an enhanced curriculum addressing these objectives and competencies.
- Define and secure the technical infrastructure and personnel resources required to support the enhanced curriculum and deliver educational programs via the Web and other forms of distance learning.
- Develop faculty skills in applying technology to enhance curricular development, student learning, and distance learning.
- Develop learning objectives and competencies in areas of identified need, including geriatrics, multiculturalism, women's health, and underserved populations.
- Develop and implement an enhanced curriculum addressing these objectives and competencies.
- Define and secure the teaching sites and educators to support the enhanced curriculum.
- Develop faculty skills in teaching in these areas.
- Develop relevant and timely learning objectives and competencies that keep pace with advances in biomedical science, particularly in human genetics.
- Develop and implement an enhanced integrated genetics curriculum.
- Develop and implement curricular programs that promote the training of physician–scientists and clinician-researchers.
- Develop core learning objectives and competencies in the area of professionalism.

- Develop and implement evaluation tools that objectively assess professional behaviors, attitudes, and values.
- Develop and implement a system of mission-based management that links educational quality and effort to funding.
- Provide the necessary resources to enhance and reward faculty teaching skills.
- Promote educational collaboration among clinical and basic sciences faculty and departments, community-based faculty, nursing, and allied health professions.

Tufts University School of Medicine

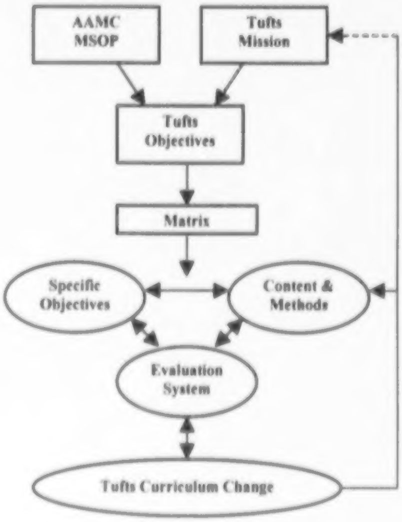
MARY Y. LEE, MD

Curriculum Management and Governance Structure

Over the past decade, Tufts University School of Medicine (TUSM) has built on its long history of innovative educational programs by creating an ongoing system of curricular change. This system supports TUSM's mission "to produce a medical practitioner who is skilled and well-educated in a core of general knowledge, one who is capable of building on this core to achieve his or her educational and career goals and to manage the task of lifelong learning." Whether graduates choose a medical subspecialty or primary care practice, biomedical research, health administration, or public health, a TUSM student has received a "liberal arts" medical education that emphasizes critical thinking, grounding in the primary data, strong clinical skills, and an appreciation for the value of lifelong learning.

- TUSM used the AAMC MSOP objectives as a guiding framework for the creation of educational objectives that were in keeping with TUSM's mission. (See Figure 1.)
- A matrix containing all the Tufts objectives on one axis and all the required courses and clerkships on the other axis helped faculty assess how, when, and where each objective was being addressed in the curriculum.
- These overall objectives were then translated into specific objectives for each course and clerkship, which in turn guide curriculum development and assessment.
- As shown in Figure 1, there are clear feedback loops among the specific objectives, curricular content and methods, and evaluation system that result in ongoing curricular change.
- TUSM's curriculum reform is built on a set of principles of how best to achieve the desired change.
    - Change should be generated by those most immediately involved (faculty and students).
    - Curriculum review and means for improvement must be ongoing and systematic (TUSM's Evaluation System).
    - Mutual respect, honesty, teamwork, and trust are essential for effective change, whether radical or incremental (our infrastructure).
- The Curriculum Committee is responsible for guiding the evaluation system, providing a framework for what should be taught and when, and reviewing new initiatives.
- Through a collaborative and coordinated process with the Curriculum Committee, faculty are encouraged to share teaching material, to synchronize lessons that are mutually reinforcing, and to integrate new material into existing courses while deleting old material.
- Student representation on committees and input through the evaluation system occur at every level.
- The dean for information technology provides the essential infrastructure for a rapidly growing on-line curriculum, distance learning, and research.
- The executive academic dean provides leadership in student and faculty research, graduate medical education, faculty affairs, and relationships with clinical affiliates.

Figure 1: Framework for Creating New Educational Objectives



Office of Education

- TUSM's administrative leadership has enhanced and strengthened educational management through the establishment of the Office of Educational Affairs (OEA) and the Center for Learning in 1994, and the appointments of the dean for educational affairs, the dean for information technology, and the executive academic dean.

- Working closely with a (2/3) majority elected Curriculum Committee (composed mainly of teachers), the OEA provides TUSM a much-needed infrastructure of educational support and coordination as well as leadership. The OEA provides systems to ensure that curriculum evolution is responsive to changing needs, flexible in implementation, and effective in improving learning and teaching.

Valuing Teaching

- TUSM's work on faculty development, recognition, and rewards continues to grow, especially with clinical faculty, TUSM continues to seek new means of encouraging clinical faculty to teach, despite mounting pressures.
- Faculty development efforts through the OEA's Center for Learning are expanding, particularly on-site training for community-based faculty by one of their own faculty trainers.
- Through the Tufts on-line Evaluation System, students have the opportunity to praise both preclinical and clinical faculty (numerical ratings and comments). In the preclinical years, lecturers and small-group leaders receive feedback. In the third-year clerkships, students are asked to note "faculty to be recognized for excellence in teaching." Each faculty named receives a letter of appreciation from the dean, and a list of these recognized faculty is circulated throughout the TUSM-affiliated medical community.
- The Milton O. M'30 and Natalie V. Zucker Teaching Prize rewards and recognizes outstanding clinical faculty for innovation, accomplishment, and the ability to motivate students. The peer selection process is specifically designed to encourage the faculty to review those attributes needed to be an effective teacher as nominations are discussed. Faculty particularly cherish this award from their fellow faculty.
- Faculty are recognized by students at the annual Senior Awards Banquet. The following awards are presented: Special Faculty Recognition Award; Outstanding Teaching in the Basic Sciences; Outstanding Teaching in the Clinical Sciences; Humanism in Medicine Award; Citations for Excellence in Teaching; Housestaff/Fellow Citations for Excellence in Teaching; MD/MPH Program Citation for Excellence in Teaching; MPH Program Citation for Excellence in Teaching; Distinguished Career in Teaching.
- The Distinguished Faculty Award was established in 1991. This award is faculty-initiated and recognizes colleagues who have made outstanding contributions to the medical school. A committee composed of faculty members holding the rank of distinguished professor selects the awardees. Awards are presented at a school-wide activity.
- The Dr. Mark Aisner Fund for Physical Diagnosis was created to foster and enhance the teaching of physical diagnosis at TUSM and at its affiliated hospitals as exemplified by Dr. Aisner throughout his illustrious 65 years in medicine. The income from the fund provides financial support in the form of stipends or awards for faculty instructors and coordinators in physical diagnosis at TUSM.

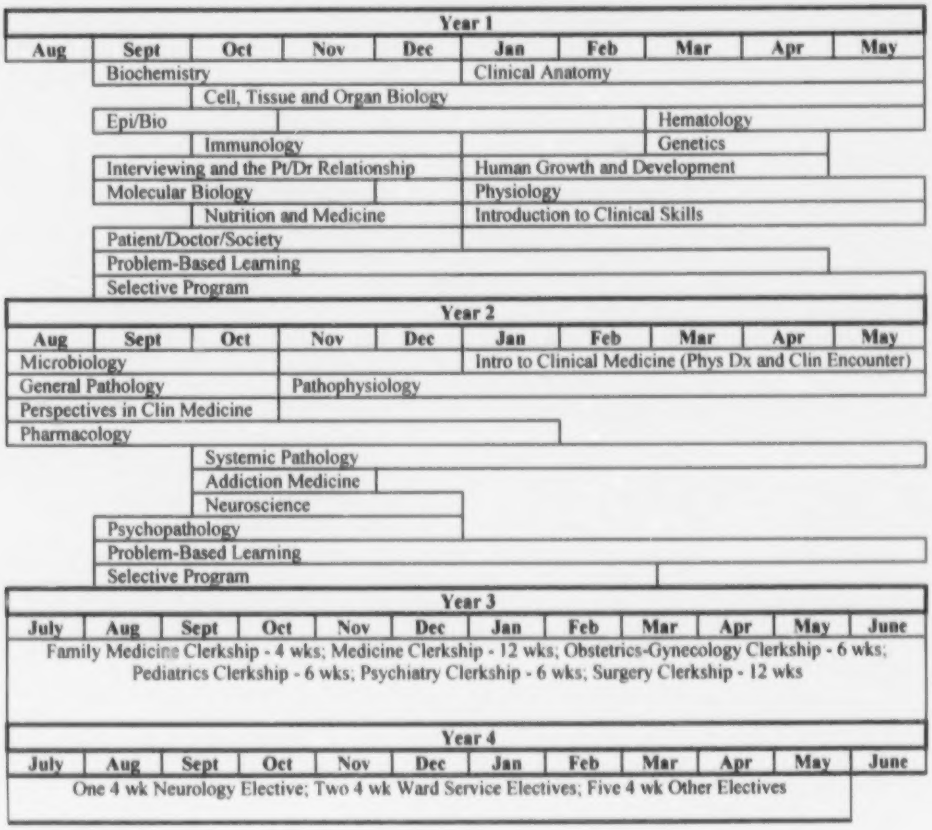
CURRICULUM RENEWAL PROCESS

Changes in Pedagogy

- TUSM has been a leader and proponent of a "hybrid" curriculum that uses the best of many teaching methods.
- Problem-based learning, begun in the early 1980s, has complemented lectures and small-group experiences, and continues to evolve with other curricular changes.
- TUSM has pushed the use of clinical cases throughout the basic sciences in lectures, small groups, syllabi, and examinations.
- Faculty development has helped faculty use more interactive lecture styles, improve small-group teaching, and incorporate extensive computer-based teaching tools to enhance student learning.
- The use of standardized patients and OSCEs complement existing assessment methods of written exams, papers, and presentations.
- The OEA has facilitated major efforts to promote curricular integration both horizontally (across one year) and vertically (across four years).
- Integration is in keeping with creating a strong foundation for lifelong learning throughout the "continuum of medical education" from the undergraduate to the practicing physician.
- The initiatives have included:
    - establishing core curricula (what, when, why to teach)
    - developing more effective teaching methods (how to teach)
    - providing adequate administrative support

In Chart 1, the retention of course labeling (to promote continued faculty and departmental "ownership" in a positive sense) belies the extensive amount of collaboration and integration that has been attained throughout the curriculum. This integration is further enhanced by online curricular materials on the Tufts Health Sciences DataBase (de-

Chart 1: Curriculum Schematic



scribed later) that allow extensive "linking" across courses and years.

- Tufts has developed five combined-degree programs (MD/PhD; MD/MPH; MD/MBA in Health Management, MD/BS-MS in Biomedical Engineering; MD/Masters of Arts in Law and Diplomacy) that allow students to earn a medical degree and a second advanced degree, usually simultaneously.
- Two of the five programs (MD/MPH, MD/MBA) allow for completion of both degrees in four years.
- Over the past few years, TUSM has been entering large sections of the curriculum into a multimedia database called the Tufts Health Sciences DataBase (HSDB). The HSDB—a combination digital library, course delivery system, and administrative tool—has been a critical tool in our integration efforts by allowing text and image searches and links across all courses, and providing multiple innovative tools that are changing the ways students learn and faculty teach.
- Tufts Managed Care Institute, a nonprofit educational collaboration of TUSM and Tufts Health Plan in 1995, works closely with the faculty and the OEA in many curricular initiatives to ensure incorporation of the managed care principles and perspectives that comprise the new context of medicine.
- A 1995 genetics curriculum task force recommended that teaching of human genetics be increased in the first two years. Through coordinated efforts of the faculty and the OEA, additional genetics was introduced into the curriculum in 1996–97. A genetics "expert panel" assists faculty in incorporating genetics material into core cases in the clerkships and other courses as appropriate to promote further integration.
- The executive academic dean is spearheading a major initiative to create a new basic science genetics department with strong links to clinical genetics that will provide an even stronger faculty base for this rapidly growing area.

- The Principles and Practice of Medicine (PPM) program integrates all of the more clinically-oriented courses such as Patient–Doctor–Society, Interviewing, Physical Diagnosis, Nutrition, and Perspectives in Clinical Medicine (geriatrics and evidence-based medicine) into a longitudinally organized program across the first two years that enhances preparation for the clerkships and beyond.
- Building on the PBL program initiated in the early 1980s, PBL cases are being developed for the third-year clerkships. Internal medicine cases were developed in 1996 and integrate pathophysiology from the second year. Surgery is updating existing cases.
- Family medicine is coordinating its cases with those of the other core clerkships to create common case "families."
- The systems subcommittees of the Curriculum Committee are also working with the PBL program to promote closer integration and coordination of the cases with the ongoing basic science courses, and evidence-based medicine the PPM Program.
- TUSM has introduced professionalism into every aspect of the curriculum and the school processes, so that students experience elements of professionalism formally in the classroom through courses such as Patient–Doctor–Society, as well as informally in encounters with faculty and administration.
- The Core Collaborators Group, composed mainly of the core clerkship directors, Curriculum Committee chair, and dean for educational affairs, was established in the early 1990s when ambulatory training and a coordinated generalist curriculum was desired across the third year. The group has achieved many of its goals, and continues to meet monthly to examine issues regarding clinical medical education such as competency-based learning objectives, content within and across clerkships, appropriate assessment tools, grading of clerkships, and assessment of site quality. This group periodically invites faculty from years one and two to discuss prerequisites for clerkships that would change content and methods for preclinical courses, and to identify opportunities to reinforce the basic sciences in the clerkships. They have also met with program directors to assess clerkship and fourth-year training in preparation for residency.

Application of Computer Technology

- Beginning with the class entering in fall 1999, computers are required.
- Working with the Computers in Medical Education Subcommittee and other faculty, the Center for Learning in the OEA explores other computer-assisted educational tools for both classroom and individual learning.
- TUSM has instituted teleconferencing and telemedicine capability across our Tufts-affiliated teaching hospitals for undergraduate, graduate, and continuing medical education, as well as initiated exciting international projects.
- In the past few years, information technology (IT) at both the university and school levels has become much stronger with the appointment of a vice president for IT and director of academic technology at the university, and a dean for IT heading a new Office of IT at TUSM.
- TUSM has created a unique, powerful, on-line curriculum resource—the Tufts Health Sciences Data Base (HSDB). The HSDB combines the capabilities of a digital library, a course delivery system, and administrative curriculum management. Its integration, scope, flexibility, expandability, and resiliency are unparalleled in medical education. The HSDB is changing the ways our faculty teach and our students learn.
- There has been growing recognition and support of the HSDB to become the model for a university-wide digital library and course-delivery system, at the same time that many other medical schools are showing interest in adopting our HSDB model.
- The Tufts HSDB provides flexible tools for
  - Efficient learning
    - —personal annotations, attached to any text or image
    - —personalized Electronic Learning Folders (ELFs©) to organize links to material
    - —zoomable images similar to a microscope
    - —seamless access to all course materials (lecture/labs, syllabi, e-journals, old exams, etc.)
    - —imbedded multimedia (videoclips in text, voice with lecture slides, etc.)
    - —self-assessment quizzes with annotated answers and links to syllabi and other resources
  - Innovative teaching
    - —content integration (increased "hot links" between courses and across years)
    - —Dynamic Individualized Assessment (DIA©) of student learning (electronic feedback to faculty on student self-assessment quiz performances, allowing faculty to address learning issues via listserv and classroom teaching)
    - —promotion of interactive teaching and knowledge application
    - —increased faculty collaboration across disciplines
    - —increased focus on learning objectives, content, and teaching methods
  - Effective administration
    - —course scheduling

- —constant Web-accessible updates
- —online evaluation
- —small-group assignments, course lotteries
- —announcements to any group/subgroup

◆ The HSDB has flourished through the collaboration of expertise from the Health Sciences Library, talented programmers, OEA curriculum management and leadership, a strong Curriculum Committee chair and members, enthusiastic faculty willing to donate hundreds of hours, and an evaluation system that allowed rapid student feedback as the HSDB evolved. Funding has been mainly through TUSM and a National Library of Medicine grant.

Changes in Assessment

◆ Standardized patient exams are slated to be part of the licensing exams for all physicians. The Center for Learning in the OEA has worked with UMass and Brown to offer our students standardized assessment of medical interviewing, exam skills, and case-management skills.

◆ A required end-of-third-year OSCE program began in 1998. The OSCEs allow student self-assessment to identify weaknesses to be addressed during fourth year. Aggregate OSCE results allow faculty to assess student skill levels for key clerkship competencies, and thereby to identify areas that need improvement in the clerkship programs.

◆ Formal mid-clerkship evaluation was introduced to all core clerkships in July 1999 through the Mini-Clinical Evaluation Exercise (Mini-CEX), based on work from the American Board of Internal Medicine for residents.

◆ The Mini-CEX helps faculty provide specific feedback to students on clinical skills used in actual patient encounters, both for ongoing improvement and for required mid- and end-of-clerkship feedback.

◆ Tufts plans additional teaching/assessment standardized patient interventions in second-year physical diagnosis that will allow students to identify weaknesses that should be addressed prior to their clerkships.

Clinical Experiences

◆ While faculty working groups were addressing core content for a generalist curriculum in the early 1990s, the clerkship directors began moving traditional ward teaching into ambulatory settings.

◆ The internal medicine clerkship moved one third of its three-month rotation into ambulatory clinics in 1992—just before the 25–30% drop in inpatient census that occurred in most Boston-area hospitals as a result of managed care.

◆ Given the rapid pace of teaching in the outpatient setting, faculty requested that students enter the third year with more clinical experience. To enhance the required curriculum even further, additional opportunities to learn practical clinical skills during the first two years were expanded.

◆ Up to 50 students in each entering class are selected to work in a primary care physician's office for one afternoon a week for two years. The faculty preceptor introduces the student to his or her practice, but also becomes a role model and mentor.

◆ Perspectives in Clinical Medicine is a second-year course that integrates the knowledge, skills, and experiences from the first year and applies them to the management of patients. The course takes on two clinical perspectives. One is a population-based perspective that focuses on the elderly. The other is methodologically based and considers the role of scientific evidence in medical practice and clinical decision making.

◆ Each semester in the first two years, students can choose either a clinical site or a clinical research project to pursue every Tuesday afternoon. One of the four required selectives must involve community service.

◆ Several years ago, TUSM students established a fully student-run (faculty-advisor–supervised), free community clinic near the medical school, the Sharewood Project. Students routinely cite their experiences at Sharewood as some of the most rewarding in their early education. Through these experiences, some of the Sharewood students have been most active in working with faculty on incorporating cultural competency into the curriculum.

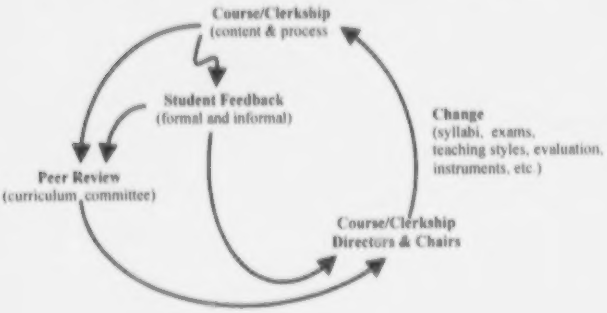
Curriculum Review Process

TUSM has created a vigorous evaluation system that places equal weight on collecting data and responding to feedback. The system has many avenues for obtaining student and faculty input, and just as many ways of informing them that they have been heard and that action has been taken. (See Figure 2.)

◆ The evaluations, reviewed for immediate action, are used in the more formal, in-depth peer review performed every three years on all required courses and clerkships.

◆ Feedback loops in each part of the evaluation system ensure that everyone concerned stays informed and is provided time to respond. Between in-depth reviews, annual progress reports are presented to the Curriculum

FIGURE 2: Curriculum Evaluation Process



Committee noting what corrective actions have been taken and what remains to be done.

- One of the greatest benefits of the new evaluation system is how it encourages collaboration between faculty and students that results in significant improvement and integration of curriculum content and methods. It has also led to a big increase in the number of evaluations returned (see Table 1).

Future Goals

- TUSM will continue to build upon its work in information technology, combined-degree programs, evaluation, systems of clinical care, and faculty development.
- The HSDB's impact on learning and teaching will continue to be monitored, but indications already exist that it is an unprecedented tool for interactive, integrated, continual learning, and information management.

TABLE 1. Changes in Evaluation Return Rates*

	Return			
Evaluations	1992	1996–97	1997–98	1998–99
Preclinical	Low	95%	95%	95%
Clerkships	22%	97%	95%	97%

*Over 10,500 evaluations processed each year beginning 1996–97.

- The Tufts HSDB is much more than a database; it is quietly becoming a model system for content storage, sharing, and delivery with potential that is just beginning to be explored.
- Work is now focusing on user-friendly interfaces for faculty to directly add, edit, and link content within the HSDB.
- Collaborative work with other health science and liberal arts schools at Tufts University is testing its applicability to any other discipline and exportability to other institutions.
- TUSM is tracking its combined-degree graduates in research, health management, and public health to assess the value and contributions of our programs.
- The school is exploring the possibility of initiating additional programs, one in bioethics and another in medical education, both of which will be combined with the traditional four-year MD program.
- Work has begun to extend the evaluation system to help track graduates in their residencies and first few years of practice. Feedback from faculty and alumni helps ensure that our curriculum remains relevant to current practice.
- TUSM continues to work with the TMCI on innovative programs to increase physician knowledge and skills in key areas of health care systems. Our programs reinforce to students that they can make a difference, that we expect them to take these lessons into practice to have a positive impact on our evolving systems of care.
- New TMCI programs, particularly with Web-based tools, are being developed in response to these rapidly changing educational needs.
- TUSM is expanding its efforts to reach community-based faculty through locally run faculty development programs.
- A significant teaching endowment is being pursued, which would provide additional funds to allocate to key clinical teachers for their considerable contributions to education at TUSM.
- TUSM is part of a new university-wide initiative on "student-centeredness" that is stimulating discussion among faculty and students about how to translate this theme in our medical school.

Michigan State University College of Human Medicine

YASMIN M. RICHMOND, MA, AND RUTH B. HOPPE, MD

Curriculum Revision

A major curriculum change was implemented in the fall of 1991. The change involved completely new courses for the first two years and completely revised and re-approved clerkships and clerkship sequence for the last two years. This change was accomplished solely with reallocated internal resources, and it involved nearly all teaching faculty and administrators in the college in planning. To date, six classes that experienced the new curriculum have graduated.

Curriculum Management and Governance Structure

- Coincident with the design and implementation of the new curriculum, new governance structures and process were also designed, ratified, and written into the by-laws of the college.
    - The change in curriculum governance was instituted in order to merge and optimize the curricular inputs of course directors with those of elected faculty and to enhance faculty involvement in curriculum management, including continuous quality improvement.
    - Block committees were created (Block I for first-year courses, Block II for second-year courses, and Block III for the clinical years), made up of each course/clerkship director, supplemented by block administrators and representatives from the Office of Medical Education Research and Development (OMERAD).
    - The block committees were made responsible for annual review of courses in a peer-review format, formulating cross-course/clerkship policies, and maximizing communication and coordination between the courses/clerkships.
    - Each block committee submits annual reports and ad hoc recommendations to the parent College Curriculum Committee (CCC).
    - The changes allowed the CCC to focus on the review of blocks rather than individual courses and on review of process and outcomes data regarding the curriculum as a whole. In this way, the CCC is able to engage in broader pedagogic discussions of the curriculum.
    - The CCC is composed of representatives from all three block committees plus six elected representatives from the faculty at large. The associate dean, the three block directors, and an OMERAD representative are ex-officio members of the CCC.
    - The CCC is guided in its activities by the college's mission, values, and principles and, most recently, written course and block goals and objectives.
    - The CCC annually reviews selected curricular themes (e.g., cancer, genetics, palliative care). It also reviews the annual Student Programs Outcomes Report, a compendium of key data derived from the admission, curricular, and postgraduation phases of the student program.
- Managing the curriculum across multiple campuses
    - The clinical curriculum (Block III) is dispersed across six communities in both upper and lower peninsulas of Michigan. Each community campus is administered by a community assistant dean, a community administrator, and a cadre of full-time and volunteer faculty.
    - In such a dispersed but integrated multi-campus system, a complex organization of matrix management of the clerkships involves many faculty and administrators expending considerable effort to achieve consistency of educational quality and student evaluation across multiple sites.
    - Each clinical department maintains an Education Committee composed of the overall educational leader for the department and the clerkship directors from the community.
- The department education committee (DEC) forms the department locus for clerkship implementation and control. It meets regularly to develop, review, and revise the clerkship for the coming year, to determine the array of assessments to be used, to set performance expectations, and to review student performance and application of standards. In each clerkship and in each community there are a common syllabus, a common set of learning objectives and experiences, and a common evaluation system. The chair of the DEC is also a member of the college Block III Committee.
- The Block III Committee is composed of the chair of each departmental education committee (see above) and of one additional discipline representative who is community-based. The Block III Committee is chaired by the associate dean and staffed by the Block III administrative director. With this departmental and college-level organization, there is strong disciplinary and community rep-

resentation. The Block III Committee sends one of its members to be a voting member on the CCC.

- The community assistant deans meet regularly with the Block III director, the associate deans, and the dean to provide another locus for dealing with environment, resources, faculty, and other administrative issues important to the success of the distributed clerkship system. The associate dean and Block III director provide a link between this group and the Block III committee and, ultimately, the CCC.
- In each community, the community assistant dean meets regularly with clerkship leaders in the various disciplines who, in turn, are members of the departmental committees described above.
- The community administrators meet on a regular basis with the Block III director and with the assistant dean for student affairs. Issues that relate to the "nuts and bolts" of clerkship administration and to the links between clerkship issues, academic support, and counseling and personal support of students are handled within this group. An example is the development of a system-wide policy on exposure to blood-borne pathogens that addresses education, prevention, and post-exposure treatment and reporting.
- These groups comprise a system that is connected, communicative, collaborative, and able to be self-reflective and self-critical. A dynamic but desirable tension exists between consistency across campuses and sites on the one hand and use of individual campus strengths on the other hand. Such diverse and complex connections have been vastly assisted by the advent of communications technology.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Explication of learning outcomes evolved over eight to nine years.
- The initial product was "Principles for a New Curriculum," emanating from an all-faculty retreat and ultimately voted upon by the entire faculty
- Subsequent products included specific course goals and objectives, followed by block objectives (three blocks comprise the four-year curriculum), all ratified by the CCC.
- The final product incorporates the educational mission statement, the set of educational principles, and all block and course/clerkship goals and objectives; this product serves as a template against which further curricular change can be considered.
- Student assessment and program evaluation are increasingly focused on the specified goals and objectives, producing a list of more concrete learning outcomes.
- Learning outcomes are organized according to category:
    - adequate knowledge of biomedical and clinical fundamentals
    - demonstration of professionalism across six virtues (competence, honesty, compassion, respect for others, professional responsibility, social responsibility)
    - clinical skills (interview, physical examination, written record)
    - problem solving/judgment.

Changes in Pedagogy

The new curriculum introduced several new elements:

- The two-track system (traditional track and PBL track) operated by the college since 1973 was replaced by a single preclinical curriculum that incorporates elements of discipline-based, large-group learning format and case-based, small-group learning format.
- The first year is discipline-based, implemented by departments; fundamentals of basic science disciplines (biological and behavioral) are learned, with emphasis on fundamental principles and language.
- Lectures are the dominant learning format (68% of first-year student contact hours). Weekly clinical correlations show the integral relationships of basic biological and behavioral sciences with clinical medicine, presented by clinician–basic scientist teams.
- The remainder of curricular time in the first year is spent in small-group format in the Clinical Skills and the mentor programs.
- The Mentor program (six students assigned to a clinician) guides students into the profession by emphasizing the values and behaviors important to the profession and provides a caring and competent physician role model with whom the students develop durable relationships. This year-long course is the keystone of the first-year curriculum in professionalism.
- In the second year, all students study within an interdisciplinary learning format, predominantly in small groups, supplemented by a limited and controlled number of lectures. This curriculum is implemented through a central curriculum office. It is organized by systems, and incorporates advanced behavioral and biologic concepts.
- Small-group experiences comprise 63% of student contact hours in the second year.
- Second year experiences include a year-long theme titled

"The Social Context of Medicine," and include four six-week modules focused on ethics, epidemiology, financing of health care, and health policy. All students participate in development of a health policy project.

- The final second-year longitudinal theme is Clinical Skills, presenting advanced concepts organized to correlate with the organ systems of the PBL curriculum (for example, during the Cardiovascular Domain, students learn about heart sounds and murmurs in Clinical Skills).
- Standardized patients are used in several components of the Clinical Skills program, especially in basic and advanced interviewing, and selected segments of physical examination instruction. Standardized patients are used both for teaching and for assessment purposes.
- The directors of the Clinical Skills and Mentor programs are currently developing the Longitudinal Patient Centered Experience (LPCE). Students will be assigned to individuals with chronic health conditions and will be expected to visit the individual/family at least 12 times over 15 months. The objective of the LPCE is to understand the experience of illness from the perspective of a patient and family and develop an appreciation for the issues involved in the patient's interaction with the health care system.

Applications of Computer Technology

- Students are required to have *access* to a computer.
- The College provides a 48-station, state-of-the-art student computing and technology center (see ⟨http://www.echt.chm.msu.edu⟩).
- Most administrative contacts with students have been electronic since 1995.
- Much courseware is available via the World Wide Web or in-house software, some required and some optional course components.
- Some performance-based assessment is being conducted by computer.
- A four-year required curriculum theme in Information Management (including informatics) is under development.

Changes in Assessment

- A new performance-assessment philosophy, developed and implemented in the early 1990s, emphasizes formative, course-based assessment across five competency domains, spaced over four years.
- Performance assessment uses standardized patients, faculty observations, and computer simulations, organized into mini-OSCEs.
- Discipline-based courses in the preclinical years have adopted frequent testing as a means of assisting students to adopt more adult learning behaviors.
- All required clerkships use NBME subject tests.
- Routine assessment of students' professionalism is now in place, spanning all four years. Demonstration of adequate professionalism is now a graduation requirement.
- A summative OSCE using a sampling approach, to be used for program assessment purposes, is being developed.

Clinical Experiences

- During the development of the new curriculum, all clerkships were challenged to incorporate both inpatient and ambulatory experiences for students, with specified learning objectives for the different sites. The amounts of ambulatory care vary by department, but all required clerkships offer some significant ambulatory experience.
- Physician coordinators of the clerkships in each clinical community recruit volunteer faculty with whom students are placed.
- There is one student per faculty member in a private physician's office. In most instances, students are allowed to see private patients without the presence of the physician, provide the physician with a brief case presentation, and return to the patient room with the physician to continue/complete the patient visit.
- Students also have in-hospital experiences on all clerkships and work with private attendings. In the community hospitals where there are residencies, students work with residents and attendings. There are usually two to three students per hospital rotation, which allows considerable opportunity for supervised, hands-on experiences.

University of Michigan Medical School

JOSEPH FANTONE, MD, CASEY WHITE, AND JAMES O. WOOLLISCROFT, MD

Curriculum Management and Governance Structure

- The medical school adopted a centralized governance structure with its revised curriculum in 1992.
- Centralized governance has worked very well to ensure student achievement, interdisciplinary approaches to teaching and learning, ample and centralized support for medical education, and high-quality courses and instructors.
- Under the guidance of the associate dean for medical education, the curriculum is managed by directors in Component I, Component II, and Components III and IV, who all meet biweekly as a working committee.
- Component directors and assistant directors are appointed and funded by the associate dean for medical education.
- Major policy issues are managed by the Curriculum Policy Committee (CPC), which is composed of elected and appointed faculty members and medical students.
- A rigorous evaluation system, managed by a distinct office and staff with direction from a medical school faculty member, is monitored by the CPC.

Office of Education

- The school's centralized governance structure for undergraduate medical education is administered through the Office of Medical Education.
- The associate dean for medical education has consolidated all activities in support of the curriculum for the MD degree in the medical school's Learning Resource Center (LRC), where students and faculty have access to support staff and resources, computers and printers, professional computer consultants, computer-based faculty development stations, small-group study rooms, classrooms and lecture halls, microscopes, the standardized patient program, and clinical skills examination rooms.

Budget to Support Educational Programs

- The associate dean for medical education provides guidance and funding to faculty who lead each of the components of the curriculum (component directors and assistant directors), as well as the director and assistant directors of the Introduction to the Patient course, the standardized patient program, and the comprehensive clinical assessment.
- There is also centralized funding available for curriculum innovations and improvements, including development of new courses, sequences, and electives; new approaches to education and assessment; and computer-based enhancements and exercises. Funding for the curriculum and curriculum leaders was established in 1992 and has been increased by the dean over the last several years.
- In 1997, the school began quantifying the cost of medical education using an activity-based cost-accounting model. With information from faculty and administrators applied to the model, the school is now redistributing funding to departments based on actual educational costs, and also centralizing additional funding to support medical education under the aegis of the associate dean for medical education.

Valuing Teaching

- The dean's office directly funds faculty members who are key leaders and administrators in the medical school curriculum.
- In the first two years, every faculty member with three or more contact hours in the curriculum is evaluated by students; in the clinical years students evaluate residents and faculty with whom they work.
- Individual faculty, course/clerkship directors, and department chairs may request student evaluations at any time.
- Documentation of the amount and quality of teaching provided is required by the medical school's promotion committees; a teaching portfolio template is provided via the Web for faculty to document their teaching contributions.
- All teaching faculty are encouraged to use evaluations of their courses and access to educational experts and computer consultants to develop innovative approaches to teaching and learning. Funding for such efforts is provided to faculty by the associate dean for medical education.
- The medical school has expanded its recognition of

teaching by adding the Medical Student Award for Teaching Excellence to its more traditional awards. This award recognizes those faculty evaluated most highly by the medical students for their outstanding teaching, and is bestowed on eight faculty each year.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school's goals of medical education were created by the faculty in 1991, prior to development of the revised curriculum. The goals state specifically expectations for medical student progress and achievement in the curriculum.
- The goals were reviewed and formally reaffirmed by the faculty and the medical school executive committee in 1996.
- A curriculum blueprint, updated by faculty every two or three years, identifies specific knowledge, skills, and competencies every medical student must possess prior to graduation from medical school. This blueprint is used as a guide for content in all four years of the curriculum.
- Each course, sequence, and clerkship has specific published objectives to be met by medical students as measured by the course director; each clerkship director also has responsibility for ensuring student learning in specific areas (e.g., signs and symptoms) identified and agreed upon by the faculty director of the clinical years and the clerkship directors.

Changes in Pedagogy

Over the past decade biomedical research has become less based in the traditional scientific disciplines, and more integrative, especially with the expansion of knowledge in molecular biology and medical genetics. Further, learning occurs most effectively in a context that simulates the setting in which knowledge and skills will be applied.

- The first- and second-year medical curriculum is designed to enhance integration across the biomedical sciences with presentation of material and learning experiences in a clinical context, including communication and physical examination skills.
- Small-group discussions, laboratories, and computer/Web-based exercises augment traditional instruction, and weekly clinically-based multidisciplinary conferences reinforce learning.
- The school is in the process of integrating specific disciplines into segments of the curriculum across all four years.
- Multiculturalism, complementary medicine, and geriatrics are just a few of the topics that are being integrated into the context of existing courses and sequences, with a focus on the patient's perspective. The topics are presented to students in the manner in which patients will present their medical problems to their physicians. This approach will encompass traditional and computer/Web-based instruction, standardized patient exercises, and patients and role models in clinics and hospitals.
- The effectiveness of the core curriculum and its integration into existing educational programs is assessed annually; methods will include the Comprehensive Clinical Assessment.
- An "educational consultant" model will also be implemented, which will allow students who have seen a particular patient in the clinic or who have worked through a case to present questions via the Web to a UM specialist, who will respond within 24 hours.
- Student progress in the specific disciplines is assessed at least once a year, and models to allow students to assess their own knowledge and skill in these areas are being developed.
- Instructional modules available via the Web have been introduced in several of the required clerkships to ensure consistent student learning and mastery of required material. The modules were developed by clerkship directors and their colleagues with computer consultants in the Office of Medical Education; they are case-based, interactive, and incorporate self-paced instruction and self-assessment components.
- Instructional standardized patient instructor (SPI) exercises have been incorporated across all four years of the curriculum; SPIs are also used for assessment of student knowledge and skills in most of the stations on the Comprehensive Clinical Assessment.
- All of the student encounters are videotaped, and students with marginal or failing performances return to review and discuss their encounters with the faculty director of the SPI program, prior to repeating the exercise.
- Communications skills and professionalism in encounters with SPIs are reviewed separately, and students must perform satisfactorily to receive a passing grade. Students must pass all SPI exercises to be promoted and to graduate.

Application of Computer Technology

- Medical students are not required to own their own computers, but support is available to those who bring computers with them to medical school.

- There are 90 computers in the Learning Resource Center (LRC), another 26 computers in medical student study areas to which they have access 24 hours a day, seven days a week, and 15 computers in the UM Hospitals medical student call rooms. There are also "E-mail express" computers available to students in the LRC and the student study areas.
- The school has created Web-based "Coursepages" for medical students, through which students have access to a variety of information, services, and original educational materials developed by LRC computer consultants with medical school faculty. Using the Coursepages, students can access a variety of administrative and educational materials, including interactive educational materials developed by medical school faculty, calendars and schedules, and quiz and exam scores. They can submit "queries" about exam items, check course and clerkship grades, complete course and teacher evaluations, submit changes of their addresses, check their university accounts, and access Medline and other Web-based resources. Students can use and take practice quizzes.
- Required first-year quizzes are administered weekly to students via the Web in the LRC. The third-year pattern-recognition examinations, administered five times throughout the year, are also available to students via the Web.
- The LRC's faculty development stations provide faculty with state-of-the-art hardware, software, and professional consultation to introduce them to technology they can use to upgrade existing teaching materials or create new computer-based materials for use in the classroom. There is no charge to the faculty for use of the stations or for consultation.

Changes in Assessment

- The Comprehensive Clinical Assessment (CCA), an OSCE-format examination, measures knowledge, skills, and competencies the faculty have identified as fundamental for graduation.
- The CCA is a four-hour examination comprising 12 stations that each student undergoes early in the fourth year.
- Content varies year to year to ensure appropriate sampling of critical clinical skills and competencies, and is determined by a faculty director and committee using the curriculum blueprint as a guide.
- To graduate, students must pass each station and the CCA overall, and must also pass a cross-station professional-skills component of the exam.
- With funding from the National Board of Medical Examiners Medical Education Research Fund, the school has expanded efforts to learn more about medical student self-assessment.
    - Over the last several years, the school has examined self-assessment in each year of medical school and across a wide range of tasks, and has also explored predictors and behavioral implications of self-assessment accuracy.
    - Studies to date have yielded a number of findings, including (1) self-assessment accuracy does not appear to relate to personal or academic variables, including academic performance, academic background or preparation, ethnicity, or gender, and (2) self-assessment accuracy may be slightly greater with more familiar tasks, suggesting a possible role for learning and experience.
    - Upcoming studies focus on the dynamics of self-assessment and self-directed learning in medical education, and begin to examine interventions that might augment these skills. One study extends previous work from undergraduate medical education into graduate medical education, and another compares problem-based learning with learning in a more traditional curriculum to study both generalizability of previous results and the impact of curricular format on self-assessment and self-directed learning.

Clinical Experiences

- Clinical experiences begin early in the first year with students' shadowing physicians in physicians' offices and clinic settings. Small-group discussions of specific topics, with each group facilitated by a physician and an educational expert, augment the shadowing experience.
- In the second year, each student is assigned to a clinical skills instructor (CSI) with whom the student will conduct five histories and physical exams throughout the year. There are two new models in place for the CSI experiences:
    - The first model is focused on early clinical skills and is predicated on bringing the patient and the physician–teacher to the student in a student-centered educational setting within the LRC. Physicians and their patients meet with individual students in the LRC clinical skills laboratories. Students do a history and physical exam on the patient under supervision, write up findings/observations, and present the patient to the faculty. This approach provides the opportunity for direct real-time feedback to the students, with videotaping availability to critique student–patient interactions, including communication skills.

  - The second model is based at the Northeast Ann Arbor ambulatory care facility, and is designed to enhance clinical education in the ambulatory setting in a structured rotation involving student, patient, and physician. Again, the experience is centered on the student–patient interaction, with supervision and feedback from the physician–teacher. Students spend one half day in clinic with physicians. Each student meets independently with a patient and conducts a history and physical exam. While the student writes up findings and observations, the physician examines the patient the student has seen. The student then presents the patient to the physician, who provides direct real-time feedback/instruction to the student, which may include returning to meet with the patient.

- Each of the clinical clerkships provides students with inpatient and outpatient educational experiences to ensure that specific learning objectives are met. "Educational consultants" (see changes in Pedagogy section above) who are specialists in specific domains will augment learning that occurs as students encounter real patients in the hospitals and clinics.
  - Clerkship faculty can also develop computer- and patient-based cases; students can work through the cases to ensure mastery of specific competencies and seek input and guidance from the Educational Consultants.

Curriculum Review Process

- In 1992 the school developed and adopted a centralized system for evaluation of the curriculum and teaching.
- The Curriculum Evaluation Office is managed by the director of the Office of Educational Resources and Research (OERR), who provides analyses of evaluation data and information and recommendations to faculty curriculum directors, the associate dean for medical education, and the Curriculum Policy Committee. A research associate manages the curriculum evaluation process and data, with assistance from an academic secretary.
- The Curriculum Policy Committee oversees the evaluation process and receives and acts on evaluation reports.
- The school evaluates six distinct areas of the curriculum, using a variety of internal and external measurements. Data are collected throughout each of the four years and at the conclusion of each academic year, and a full evaluation cycle is completed every four years. Follow-up evaluations of students by residency program directors occur one and three years after graduation. See Table 1 for more information about the evaluation process.
- Evaluation instruments.
  - The annual survey instruments are organized to measure achievement of the ten goals of medical education. To facilitate the comparison of students' educational experiences across all four components, comparable evaluation instruments are structured with

TABLE 1. The Evaluation Process

Area Evaluated	Source of Data/Information
Faculty and student attitudes/opinions	Faculty surveys (clinical and basic science) Student surveys (first, second, third, and fourth years) Longitudinal surveys (following graduation)
Student performance	Admission criteria Course/clerkship grades USMLE scores Comprehensive Clinical Assessment scores Faculty evaluations of students Residency program director evaluations
Faculty effectiveness	Student evaluations of faculty Faculty surveys Student surveys Longitudinal surveys
Curriculum content	Student evaluations of courses, sequences, and clerkships Student evaluations of components Faculty course/clerkship committees Faculty curriculum retreats Component directors' evaluations of curriculum Component III sequential exam External review of curriculum LCME standards
Educational process	Student evaluations of faculty and courses, sequences, and clerkships Peer evaluations of faculty Faculty course/clerkship committees Faculty curriculum retreats Component directors' evaluations of curriculum Longitudinal surveys Student surveys
Management of the curriculum	Review of the curriculum Component directors' satisfaction Faculty and student feedback to dean
Overall curriculum effectiveness	Composite USMLE Step 1 and Step 2 scores Residency placement of students Residency program director evaluations Overall CCA scores Faculty evaluations AAMC Graduation Questionnaire

a core of common items. Though different evaluation forms are used to assess clinical and basic science teaching, core evaluation items are included on all forms. Course, sequence, and clerkship directors may add additional items to their course, sequence, or clerkship evaluation instruments in order to capture information relevant to their unique educational offerings.

- Student evaluations of teachers and curriculum
  - Components I and II: Students are randomly assigned to four different cohorts (approximately 42 students per cohort), each of which is responsible for evaluating selected educational experiences during a half semester. Thus, 100% of the class is involved in the evaluation process, but no student is involved for more than half of a term. During their assigned half-term, students are asked to complete evaluations of faculty presentations, courses, and multidisciplinary conferences. All faculty with three or more hours of contact with students are evaluated, and faculty with fewer contact hours can request to be evaluated. All students participate in end-of-year component surveys.
  - Components III and IV: In Component III, all students complete clerkship and clinical faculty teaching evaluations at the conclusion of each of the required clerkships. Each Friday, all students complete an evaluation on the Component III weekly seminars. The overall Component III experience is evaluated at the middle and end of the academic year by all students.
  - In Component IV, all students are asked to complete an evaluation of their first six months of clinical rotations. At the end of Component IV, students are asked to complete an evaluation of Component IV overall, and also to share their impressions of the four-year curriculum.
  - Two years ago, the school shifted its evaluation process from paper-and-pencil to Web entry. Students can now enter their evaluations and comments directly via the Web, and the program allows easy tracking of students to remind those who have not completed their evaluations.

Program in Professionalism

- The University of Michigan Medical School has developed a comprehensive program to ensure that students understand the importance of professionalism in medical practice and acquire appropriate professional skills prior to graduation.
- The program begins during orientation to medical school with an oncologist who presents one of his or her patients and the patient's spouse. They all speak candidly to the class about the patient's cancer, the patient's relationship with the physician, the patient's personal and medical experiences since diagnosis, and the effects of the illness on the patient's life and family. Students are then encouraged to participate, and many ask probing and thoughtful questions about the difficulty of breaking bad news to patients, the essence and significance of the physician–patient–family relationship, trust, compassion, ethics, and personal and professional values and beliefs.
- The program in professionalism is incorporated throughout the four years of medical school, with assessments and feedback along the way. Specific components are
  - physician–patient presentations (in the first and second years)
  - small-group discussions (based on specific cases and experiences)
  - scripted encounters with standardized patients (in all four years)
  - role models (in all four years)
  - concern/commendation cards
  - assessment of professional behavior on all clinical clerkships
  - assessment of professional behavior on the annual Comprehensive Clinical Assessment
  - formal presentations by physicians about professional behavior (orientation, seminars in medicine, specific course/clerkship exercises)
- During the standardized patient encounters, the clinical clerkships, and the Comprehensive Clinical Assessment, student professionalism is assessed as a separate domain and followed longitudinally. Those students whose skills are below a certain level are provided with feedback and required to complete and pass remedial exercises. Demonstration of appropriate and consistent professional characteristics is a stated and published requirement for graduation.

Future Goals and Challenges

- There will be an increased emphasis on the development of communication skills and recognition of the importance of the personal and social context in providing health care to patients.
- There will be a continued emphasis on and assessment of professionalism and professional characteristics.
- There will be incorporation of additional student-cen-

tered learning approaches into the curriculum (e.g., the Educational Consultant model).

- The integration of specific topics and assessment of mastery throughout the four-year curriculum will be continued.
- There will be continued development of educational experiences to prepare students for practice in evolving health care delivery settings and medical management models.

Wayne State University School of Medicine

ROBERT R. FRANK, MD

Curriculum Management and Governance Structure

- Since 1992 the school has built an effective educational management team consisting of the associate dean, faculty members in charge of preclinical and clinical curriculum, staff in charge of curricular management, academic support, faculty support, instructional technology, standardized patients, OSCE, conjoint support services, information technology, and testing and evaluation.
- The governance of the program is more centralized, with increased authority for the curriculum placed in the hands of the associate dean. Deans for admission and student affairs report to the associate dean.
- There is still considerable decentralized authority for delivery of the curriculum at the departmental level in the hands of course and clerkship directors reporting to chairs.
- A Curriculum Committee is the decision-making body for all curricular issues.
- All appointments to the Curriculum Committee are made by the Faculty Senate, which is democratically elected by the faculty.
- The associate dean chairs the Curriculum Committee.
- A separate Curriculum Evaluation Committee is staffed by the Office of Academic and Student Programs, appointed by the Faculty Senate.

Office of Education

- An Office of Academic and Student Programs was established in 1992.
- During the period 1992–present, the office has been responsible for implementing a variety of new programs, and has been of great support to the faculty as they carry out their teaching mission.

Budget to Support Educational Programs

- There has always been a budget for educational support, but over the last year there have been negotiations with the administration for a separate budget for all student-related activities.
- The budget is funded through a combination of general fund revenues, gifts from alumni, and practice-plan monies and grants.

Valuing Teaching

- The university uses a teaching portfolio for all issues regarding promotion and tenure. This has provided an opportunity to highlight the importance of teaching and encourage the faculty to carefully document teaching accomplishments.
- Approximately 10% of our full-time faculty/year (80–100 faculty) are honored through the university teaching award program ($1,000 stipend plus recognition).
- The students have teaching awards for full-time and voluntary faculty.
- The dean, in a certificate recognition program, honors voluntary faculty (over 2,000 physicians).
- All course and clerkship directors are given stipends for their work on a yearly basis.
- A portion of faculty merit pay is based on teaching quality.

CURRICULUM RENEWAL PROCESS

- In 1995, after a faculty retreat, the school adopted a five-year plan for renewal of the curriculum. It was referred to affectionately as "radical incrementalism" and identified a series of incremental steps, which faculty believe were necessary to affect a major curricular reform.
- There were eight major themes: curricular integration, addition of vertical curricular themes (across all four years), shift to ambulatory education, rewards for faculty, enhanced mentoring program, developing a more welcoming environment for students, identification and measurement of educational outcomes, and early exposure to clinical medicine.
- The dean was supportive and provided most of the resources needed for planning and implementation. The remainder was obtained from educational grant monies.
- The process has worked for us. Naysayers felt that making a series of incremental changes would never transform the curriculum. But because of support from the

dean and a team of dedicated and committed medical educators, the faculty have made most of the changes recommended in 1995 retreat.

Learning Outcomes

- Learning outcomes for the undergraduate medical education program have been established for many years.
- The learning outcomes have been updated twice since 1998. Prior to graduation from medical school, a student will have demonstrated to the satisfaction of the faculty:
  - Understanding of normal structure of the human body (cell, tissues, and organs)
  - Understanding of normal function of the human body (cell, tissues, and organs)
  - Understanding of the nature and course of alterations in function produced by etiologic agents and mechanisms (pathophysiology)
  - Understanding of the nature and course of alterations in structure produced by etiologic agents and mechanisms (pathologic anatomy)
  - Understanding of the nature of "laboratory techniques" useful in identifying diseases or health problems: (a) understanding of the actions, metabolism, and toxic effects of drugs; (b) understanding of the therapeutic uses of drugs
  - Ability to perform a satisfactory physical exam
  - Ability to take a satisfactory medical history, including psychosocial, nutritional, and sexual dimensions
  - Ability to utilize appropriate interactive skills in eliciting a history and relating to patients
  - Ability to utilize data from the history, physical exam, and laboratory evaluations to develop a provisional diagnosis and/or understanding of the health problem
  - Ability to formulate appropriate differential diagnoses
  - Ability to formulate effective management (treatment and rehabilitation) plans for diseases and other health problems
  - Ability to monitor the courses of illnesses and to appropriately revise management plans
  - Understanding of normal growth and development
  - Understanding of principles and concepts underlying normal behavior and mental illness
  - Ability to diagnose and participate in the management of mental illness
  - Understanding of the aging process
  - Ability to establish a satisfactory working relationship with patients
  - Understanding of the concepts and principles of primary care
  - Ability to apply the concepts and principles of primary care in the delivery of health care
  - Understanding of the relationships between health and illness, the patient and the patient's environment
  - Ability to apply psychosocial principles and concepts in the delivery of health care
  - Understanding of preventive and health maintenance principles and techniques in the delivery of health care
  - Ability to apply preventive and health maintenance principles and techniques in the delivery of health care
  - Understanding of the humanistic values related to health care
  - Ability to apply value (humanistic)-oriented criteria in the delivery of health care
  - Understanding of the principles and techniques of cost containment
  - Ability to apply cost-containment principles and techniques in the delivery of health care
  - Understanding of the health care delivery systems, including social, economic, and political dimensions
  - Understanding of the concepts that are the basis for research efforts that might have important clinical applicability
  - Ability to interpret statements and conclusions found in medical literature
  - Ability to recognize personal educational needs and to select and utilize appropriate learning resources
  - Understanding of the need for and value of working cooperatively with other health care workers in the delivery of health care
  - Understanding of the need for and value of consultations and referrals in the delivery of health care.
- Using the learning objectives as a template, each department has gone through a process of writing goals and objectives for its individual courses and/or programs. [This list is available from the author.]

Changes in Pedagogy

- The curriculum has gone from a program of over 80% lectures to a program that is about 50% lectures in years one and two.
- Lectures have been replaced with small groups, computer-assisted instruction, self-study, conferences, and panel discussions.
- Case studies are used in every preclinical course.
- Clinicians have been incorporated into all preclinical courses.
- Standardized patients are used in the interviewing pro-

gram, in some of the pathophysiology units, and in an OSCE.

- There are currently series of integrated curricula that span all four years: interpersonal violence; occupational environmental medicine; alcohol, tobacco and other drugs; managing care; care at the end of life.

Applications of Computer Technology

- All students go through computer basics at orientation but do not have to own computers
- The school has upgraded and modernized the application of computers to learning.
- Two modern computer facilities in the adjacent medical library have available about 60 new computers.
- There are two new computers in each of 12 multidisciplinary labs.
- Most of the basic science courses have at least one computer-assisted lab or exercise, some more.
- Use of the computer is mandatory as part of the public health course.
- The school is currently experimenting with the use of Palm Pilots® for clinical tracking of third- and fourth-year students.

Changes in Assessment

- Standardized patients are used to teach interviewing skills, in some departmental exams, and in specialized exams (pelvic) and the year-end OSCE.
- Computers are used for evaluation in the public health course.
- Faculty observations are used in the Introduction to the Patient course, in the physical diagnosis course, and in all of our clerkships and electives.
- There is a 12-station OSCE at the completion of the third year. Results are used in a prescriptive manner to help students with significant deficits to design their fourth year.

Clinical Experiences

- Students go to physicians' offices in the Introduction to the Patient course in the first year.
- During the third year, students are in physicians' offices for their year-three continuity clinic; there is also an ambulatory block rotation in the fourth year.
- Students are in the Detroit Medical Center as well as hospitals in the tri-county area for their entire third and fourth years, supported by our community hospital education consortium, the OHEP Center for Medical Education.
- There are students in clinics, doctor's offices, nursing homes, and hospices.
- Students also make home visits in their family medicine rotation.

Curriculum Review Process

- Most aspects of the change are evaluated through the Curriculum Committee and the Curriculum Evaluation Committee. Beginning in 2000, the change and the change process are being evaluated on a macro level.
- The school's educational program is evaluated on three levels:
    - Every course and program is evaluated each year by the students in an organized format culminating in a report that is presented to each course director and chair. Each department then responds to the students' concerns in writing. The Office of Academic and Student Programs oversees this process.
    - The next level is the Curriculum Committee, which monitors grades, board scores, student complaints (two students from each class are on the Curriculum Committee), AAMC Graduation Questionnaire, and OSCE.
    - The final level is the Curriculum Evaluation Committee, which takes on larger projects. That committee is currently looking at the monitoring systems for ensuring the quality of experiences in clinical education across sites.

Mayo Medical School

JEB HALLET, MD, AND ROGER HARMS, MD

Mayo Medical School began a complete reorganization of its curriculum and a revisioning process for the school during the 1990s. This effort touched upon every element of the undergraduate educational endeavor from admission to outcome assessment. The results have been a watershed in the recruitment of an outstanding national pool of students and the production of graduates who are poised to be leaders in medicine. As a result of this intense strategic planning, almost all elements of Mayo Medical School are new and continue to evolve at a planned and thoughtful pace. Success is due to the foundation laid in the strategic plan of 1990.

Curriculum Management and Governance Structure

- Mayo Foundation governs all activities at Mayo Clinic Rochester, Mayo Clinic Jacksonville, and Mayo Clinic Scottsdale.
- A board of internal and external trustees governs the foundation. Mayo Foundation has a physician-led, consensus-driven management structure.
- The Foundation Education Committee governs education activities. The chair of the Foundation Education Committee plays a role similar to that of the provost at a university. Mayo Foundation has five schools:
    - Mayo Medical School grants the MD degree, the MD–PhD degree jointly with the Mayo Graduate School, and the MD–OMS degree jointly with the Mayo Graduate School of Medicine.
    - Mayo Graduate School grants the PhD degree in biomedical sciences. It grants the joint MD–PhD degree together with Mayo Medical School.
    - Mayo Graduate School of Medicine includes all of the residency and clinical fellowship programs and the research-based postdoctoral fellowship programs, totaling 1,055 residents and fellows.
    - Mayo School of Health Related Sciences educates students in the allied health professions. It has 27 certificate, associate degree, bachelor's degree, and master's degree programs.
    - Mayo School of Continuing Medical Education oversees, organizes, and accredits all of the continuing medical education activities.
- The total enrollment of students and trainees in the five Mayo schools is approximately 2,000. The continuing medical education programs enroll approximately 26,000 registrants each year.
- Each school is governed by an education committee, which is chaired by the dean of the school. The detailed administrative structure of each school reflects the function and educational programs within the school.
- Mayo Medical School has a dean and three associate deans. The major responsibility of the associate dean for academic affairs is the organization and management of the curriculum of the medical school. The major responsibilities for the associate dean for student affairs are student affairs, financial aid, and admissions. The major responsibilities of the associate dean for faculty affairs are faculty development and promotion.
- The dean is responsible for setting the vision for the medical school and leading the school towards that vision. The dean is responsible for overall budget of the medical school and for external relations between the medical school and other components of the foundation and all outside organizations.
- The major changes in administration of the education programs since 1990 revolve around two major issues, the growth of programs and the migration to a three-campus model.
- The educational programs have approximately doubled in size since 1990.
- In addition, there are Mayo Clinic campuses in Rochester, Minnesota, Scottsdale, Arizona, and Jacksonville, Florida.
- All educational activities are managed based on an integrated three-campus model.
- The optimal governance structure continues to evolve to maintain maximum efficiency, effectiveness, and flexibility.

Office of Education

- There is not an office of education at Mayo Medical School.
- A major proposal to develop a Faculty Resource Center, which will combine the traditional strengths of an office of education with a center to facilitate optimal use of

technology in education, has been approved in concept and is in the planning stage.

Budget to Support Educational Programs

- All educational programs have a defined budget.
- The budgeting system at Mayo is mission-based.
- The annual budget for education is determined each year by the schools working together with the foundation.
- The budget allocated for education in fiscal year 2000 is $132,000,000; of this, $10,000,000 flows to the educational budget of the undergraduate medical school.
- Revenue for the medical school includes endowment income, tuition, state capitation, extramural funding from grants and foundations, and general Mayo clinical revenues.

Valuing Teaching

- The medical students evaluate faculty in every course.
- The outstanding teachers are recognized periodically, receiving special awards that include Teachers of the Year, Faculty Recognition Awards, and Distinguished Educators.
- The deans publish an annual brochure highlighting the names of all teachers recognized by students.
- The school has a unique budgeting system that directly reimburses a department for the time each faculty member spends in teaching and preparation. This includes classroom, laboratory, and bedside teaching.
- Department chairs are strongly encouraged to ensure that their faculty use this protected teaching time.
- The Mayo Medical School Core Faculty program was introduced in 1999.
- Core teaching faculty are identified jointly by departments and the medical school. Within this program, faculty are recognized by being invited to participate in faculty development workshops—the "Time to Teach" series.
- The workshops last one to two days and occur during the regular working week. The attendee's department is reimbursed by the medical school for the time of attendance. This allows almost 100% participation and does not take away from personal time while recognizing the clinical and research pressures of the institution.
- A new appointment category has been established, and the first faculty will be named to these positions in 2000. The clinician–educator and research–educator appointees will be individuals with major career interests in medical education. Thirty individuals will be named to these positions.
- Faculty members with this type of appointment will have 20% of their time supported by the education budget. They will be responsible for the development of new education initiatives and programs; they will be expected to be the leaders in education scholarship.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The medical school education committee studied and carefully chose outcomes to reflect each of the goals and objectives for the medical school—only measurable outcomes were acceptable. [The list of goals may be obtained from the authors.]

Changes in Pedagogy

- Changes in pedagogy at Mayo Medical School have been profound. Reorganization of the curriculum that began in 1991 facilitated the adoption of case-based, small-group teaching throughout all four years of the curriculum.
- Currently, all of the organ-system courses in physiology and pathophysiology are taught with a case-based structure.
- Courses have a unique faculty leadership. The majority of the courses in scientific information and organ systems are team-taught by clinicians and basic scientists or pathologists.
- Standardized patients play an important role in the introduction of clinical skills in medicine, pediatrics, obstetrics–gynecology, surgery, and psychiatry.
- Special faculty training sessions have been held to enhance skills and the use of standardized patients in teaching and assessment. National leaders in the field have been coming to Rochester to aid our faculty in this regard.

Application of Computer Technology

- For the past three years, medical students have been required to own or have access to computers.
- The requirement that students have computers was a

critical assurance to the faculty that they could rely on the use of computer-aided instruction in support of their courses. Once the faculty were so assured, the numbers and variety of computer resources available to our students increased exponentially.

- From a pedagogic point of view, perhaps the earliest success of computer technology has been the provision of images derived from cases, small-group discussions, and lectures, which were traditionally available to the student only during the course of contact hours.
- The availability on the Mayo Intranet of such images has revolutionized the teaching of numerous subjects, specifically histology, gross anatomy, and pathology.
- The school has adopted a standard teaching software, and we have been able to direct our faculty toward its use. This has enhanced substantially the number of offerings that can be available to the student in common formats with familiar navigation tools.
- The use of computers in problem solving, delivering enhanced acquisition of information, and the presentation of assignments to the faculty has also enhanced the overall learning of our students.
- Another arena in which computers have revolutionized the life of medical students has been the use of clinical-care tools in the clerkships.
- The school is moving toward an entirely electronic medical record where patient orders, laboratory reports, and radiology images are immediately available to aid in patient care.
- The entry of clinical notes and the routine provision of prescriptions are now computer-based tasks.
- The students have used decision-support software to aid in differential diagnosis and the formulation and management of patient problems. These programs are available uniformly throughout the campus.
- As an administrative tool, computers have substantially enhanced education management at the medical school.
- Web-based tools are used for all course evaluations, to provide grades, and to develop transcripts.
- Web-based tools are used to monitor the progress of students in skills acquisition and are used extensively in communication between students and faculty.
- In developing these resources, it became clear that a specific group was required to aid the medical school education committee in the oversight of computer technology.
- The Technology in Medical Education Subcommittee was formed and directly reports to the Medical School Education Committee and the dean.
- Membership of the subcommittee includes system-wide personnel, including clinicians, library personnel, instructional development personnel, and a technology expert familiar with all of Mayo's internal systems.

Changes in Assessment

- Assessment methods at the school have been examined carefully to assure that measurements of elements of student performance that go beyond cognitive expertise are undertaken to provide both formative and summative assessments of the students.
- Use of standardized patients has been fundamental to teaching and evaluating students in the early portions of the clinical curriculum.
- As the students mature, they are evaluated in OSCEs that are required as a comprehensive evaluation before moving on to the fourth year of the curriculum.
- All students are observed by experienced faculty in their provision of patient care and evaluated specifically for their expertise and performances of fundamental clinical skills. These observations influence grading more profoundly than do performances on standard measures of cognitive achievement.

Clinical Experience

- With the development of the revised curriculum, clinical experiences are integral throughout the entire curriculum.
- Each year has important clinical teaching, including preceptorial experiences in the first half of the first year, and the complete Introduction to the Patient course; with the acquisition of fundamental clinical skills culminating in the complete physical examination of a Mayo patient by a first-year student in May each year.
- The second curricular year is quite unusual, in that clinical experiences in each of the required clerkship subjects occur as half-day experiences integrated with the learning of pharmacology and pathophysiology.
- These important clerkships solidify the student in the recorder role of a physician and begin to introduce skills of differential diagnosis.
- The third-year clerkships begin to move students into the manager role as they have a second exposure to all of the basic clinical fields, so that by the fourth year students are ready to assume responsibility for their patients in subinternship experiences.
- In every clinical clerkship, students are exposed to both outpatient and inpatient components in the offices of the physicians of Mayo Clinic and in the units of Mayo's hospitals.
- Rural medical experiences are also provided for students, who have family medicine preceptor arrangements in the second year, and many students have exposures to the unique psychiatric patient base of the Federal Medical Center locally in Rochester, Minnesota.

Curriculum Review Process

- Educational programs are reviewed continuously at Mayo Medical School.
- The review follows the structure of the curriculum, with a committee to govern each of the following themes: the Scientific Foundations of Medical Practice; the Organ Systems; the Patient, Physician and Society; the Clinical Experiences; and the Research Trimester.
- The chairs of these committees, the deans, administrators, and at-large members of the faculty serve on the governing committee of the school, the Medical School Education Committee.
- Of importance, it should be noted that two students are members of the Medical School Education Committee, and students serve as full voting members on each of these governing subcommittees of the curriculum.
- The chairs of these curriculum committees and two alumni serve as a think tank for the guiding and oversight of the curriculum, aiding the associate dean for academic affairs in planning and strategy.
- Recent issues addressed by this group include the appropriate use of technologic enrichment of teaching at Mayo Medical School, and a complete review of our curriculum content in response to the AAMC's Medical School Objectives Project, concentrating particularly on the evaluation of student behaviors.
- Ongoing evaluation of the curriculum continues in a structured fashion through the curriculum committees, through the Medical School Education Committee, and from student feedback.
- The results of this strategic plan and its manifestation in the structure and function of the school have been the rising reputation of our school nationally, extremely high satisfaction scores on the AAMC's Graduation Student Questionnaire, and remarkable success of our graduates in the compassionate practice of medicine.

University of Minnesota, Duluth School of Medicine

RICHARD G. HOFFMAN, PHD

Curriculum Management and Governance Structure

- Over the past decade, the school has adopted a dual system of course management, with responsibilities divided between course directors and course faculty (who are directly responsible for managing courses) and department heads (who are responsible for providing content experts to course directors and identifying relevant content).
- An Educational Policy Committee (EPC) is the standing curriculum advisory committee and is composed of administrators and faculty members who advise on all educational issues.
- All course directors are members of a standing subcommittee of the EPC.

Office of Education

- The Office of Curricular Affairs has existed since the inception of the medical school.
- A Division of Educational Resources housing a Learning Resources Center containing computer workstations and software media supports the office.
- Three years ago, the Electronic Educational Development Unit was added to provide hardware and software support for faculty in the area of technology-enhanced learning as well as personnel with expertise in Web-based learning and multimedia courseware.

Budget to Support Educational Programs

- Funds for the operation of the Office of Curricular Affairs are set aside from the general operating budget of the school.
- Each course is given a separate, discrete budget, which is monitored by the course director and the dean of curriculum, to cover all course expenses (including copying of handout materials, postage, and hiring of guest lecturers and clinical faculty lecturers).

Valuing Teaching

- Each year, outstanding basic science and clinical teaching faculty are recognized by student vote as Teachers of the Year, which includes a monetary award.
- Over the course of the last two years, the quantity and quality of teaching effort have become increasingly important in awarding annual compensation and, in some cases, bonuses for exemplary performance.

CURRICULUM RENEWAL PROCESS

- Prior to 1990, the curriculum of the school was primarily a departmentally administered traditional curriculum.
- Individual departments determined the content of most of the courses, and there was minimal coordination of teaching efforts across disciplines.
- Most preclinical courses were lecture-based.
- Over the last decade, the curriculum has evolved into an integrated, multidisciplinary, systems-based curriculum that includes problem-based and case-based learning, technology-enhanced learning, and two multi-station OSCEs with simulated patients in the preclinical years.
- The Rural Preceptorship Program continues to be an integral part of the preclinical training years, and has been broadened by the development of a seven-site multidisciplinary Rural Health School elective in years three and four.

Learning Outcomes

- Two years ago, the faculty agreed upon educational competencies for the medical students. [These competencies may be obtained from the author.]

Changes in Pedagogy

- The use of PBL methods was begun eight years ago, and currently includes 22 cases in six integrated courses in years one and two.
- Case-based instruction is employed in several courses as

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well, and case-based clinical pathology conferences have been increased in number and complexity in the first and second years.

- Sixty percent of the full-time faculty have been trained as PBL facilitators.
- Two years ago, an integrated, multidisciplinary, systems-based curriculum was put into place following several years of planning.
- The curriculum integrates basic science and clinical offerings across multiple specialties and departments within organ-system–based modules.

Application of Computer Technology

- Students are encouraged, but not required, to purchase their own personal computers.
- There are workstations, laserdisc players, and printers available in the Learning Resource Center 24 hours per day (approximately one workstation for every eight students).
- The school has begun to develop its technology-enhanced learning capabilities via an active-learning resource center and an Electronic Educational Development Unit.
- Faculty have authored several interactive programs in histology, pathology, pharmacology, and neuroanatomy that are now commercially available and making the transition to multi-platform CD-ROM.
- Medical student classrooms all have computers and computer projector systems, and faculty are strongly encouraged to develop course Web resources and multimedia presentations.
- All course evaluations and instructor evaluations are Web based, as is lecture scheduling.
- In 2000 the school began using the Audience Response System for classroom teaching, which allows immediate student feedback and quizzing.
- The medical school's Rural Health School offers multidisciplinary training in rural medicine at seven practice sites in Minnesota.
- Each rotation is ten to 12 weeks long and includes participants from the University of Minnesota programs in medicine, nursing, pharmacy (PharmD students), public health, and social work, as well as physician assistant students.
- Students communicate with faculty mentors and health care providers via e-mail, ITV, and telephone conferencing, and engage in live video medical consultations.

Changes in Assessment

- Standardized patients are included in two multi-station OSCE examinations in the second year.
- For the past three years, exams in two of the family medicine courses have been computer-assisted.

Clinical Experiences

- First-year students complete 12 four-hour blocks in ambulatory family medicine in the offices of community physicians in the preceptorship program, during which a geriatrics elective is also offered.
- Second-year students complete three 72-hour blocks in ambulatory family medicine in the offices of rural community physicians.
- Second-year students complete brief introductory rotations in medicine, family medicine, surgery, ob–gyn, and pediatrics in the Clinical Rounds and Clerkship (CR&C) course.
- The CR&C course includes inpatient, outpatient, and nursing home experiences.
- The UMD School of Medicine is now the only remaining two-year, separately accredited medical school in the United States, and as such provides primarily preclinical training to first- and second-year medical students.
- Under arrangements with the University of Minnesota Medical School in Minneapolis, all students who successfully complete the two-year program at Duluth are accepted for transfer to the medical school in Minneapolis to complete their MD degree requirements.
- The UMD School of Medicine does, however, offer clerkship training to third- and fourth-year medical students for the following required or elective rotations: medicine I, clinical medicine IV, ob–gyn, neurosurgery, ENT, urology, emergency medicine, family practice rural rotation, family practice clerkship, sports medicine, cardiovascular medicine, orthopedics, physical medicine, rehabilitation, ophthalmology, and radiology.

Curriculum Review Process

- The revised, integrated, multidisciplinary, systems-based curriculum has been in place for two years and has been reviewed on a yearly basis by the EPC.
- The review has relied primarily upon national benchmark performances (Comprehensive Basic Science Exam, USMLE Step 1) in addition to survey data from

current and previous students, performances on clinical rotations, and a comparison of exam question performances between the new curriculum and the preceding curriculum within each basic science discipline.

- Residency match success will be added as a variable this year in comparison with the success of previous students in the preceding curriculum.
- Residency performance and practice satisfaction/performance benchmarks will be compared in the future as the cohort of students who have completed the new curriculum proceed in their training.
- In 2000 a new position was created and funded within the Office of Curricular Affairs to examine educational outcomes on an ongoing basis in the future.

University of Minnesota Medical School—Minneapolis

GREGORY M. VERCELLO HI, MD, THOMAS B. MACKENZIE, MD, AND ILENE B. HARRIS, PHD

Curriculum Management and Governance Structure

- The governance and management of the educational program were revised in 1998 following a school-wide strategic planning process that created an Education Council (EC) to advise the dean on matters of educational policy.
- The EC was designed to ensure dialogue among faculty constituencies responsible for the education program—department heads, course directors, and faculty leaders.
- Administrative personnel from Curriculum Affairs, Student Affairs, Admissions, and the Office of Educational Development and Research are ex officio non-voting members.
- The senior associate dean for education also sits on the EC. The chair, appointed by the dean, receives salary support for this activity.
- Overall responsibility for management of the educational program lies with the senior associate dean for education (a new position), who reports directly to the dean of the medical school.
- Operation of the education program is the responsibility of the curriculum director, who is chair of the Curriculum Committee (CC), composed of all required course directors. The CC is responsible for the implementation of curriculum.
- The directors of year one (basic sciences and Introduction to Clinical Medicine), year two (pathophysiology), and years three and four (core and elective clerkships) report to the curriculum director. Course directors report to their respective year directors.

Office of Education

- The Office of Educational Development and Research (EDR) was created in 1998 with the appointment of a director and the recruitment of a coordinator.
- Prior to 1998, activity related to faculty development, course assessment, student evaluation, curriculum development, and educational research had been managed by a faculty member in the Curriculum Affairs Office.
- The EDR provides faculty with collaboration and support on curriculum and faculty development, evaluation of programs and student performance, and education/research.

Budget to Support Educational Programs

- The Office of Education, directed by the senior associate dean for education, has a budget that supports administration of student affairs, curriculum affairs, admissions, and educational programs without departmental affiliation. The budget is negotiated yearly with the dean.
- Funding for departmental activities and faculty effort related to medical student education is not part of a discrete budget; however, efforts are under way to identify the costs of these efforts and to fund them from state appropriations. It is likely that such support would remain part of a department's overall yearly budget negotiated with the dean.

Valuing Teaching

- Through the Minnesota Medical Foundation, the medical school coordinates the annual selection by students from each class of a faculty member to receive the Distinguished Teaching Award.
- The foundation solicits faculty nominations yearly and selects one faculty member to receive the Outstanding Medical School Teacher Award.
- Two years ago the university began selecting eight faculty members from the graduate and professional schools each year to receive the Graduate–Professional Teaching Award. The award carries with it a $3,000-per-year lifetime stipend during tenure at the university. The medical school submits five nominees per year, and to date three medical school nominees have received this award.
- The medical school has recently established the Academy of Medical Educators to recognize excellence in teaching.
- Recipients of the aforementioned awards and one faculty member per year selected by the academy itself will be members and recognized with a photograph and plaque in an public area adjacent to medical student instructional space.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In February 1998 the senior associate dean for education convened a broadly representative group of 35 faculty members to assess progress in primary care education in the medical school curriculum and make recommendations for changes.

- The faculty group built on committee reports commissioned in 1993 and 1996 aimed at establishing the basic competencies expected of all graduates.
- Faculty approved a set of learning outcomes for graduates of the school. [The learning outcomes are available from the authors.]

Changes in Pedagogy

- In 1985 a small-group format was introduced into the second-year pathophysiology curriculum. The ratio is roughly two hours of lecture for every one hour of small-group. Most of these group sessions are built on clinical cases, and in many instances they use a problem-based method.
- Plans are under way to create standardized clinical case narratives for use by year-one lecturers when illustrating the application of basic science principles.
- In the last two years standardized patients have been recruited and trained to simulate specific clinical encounters.
- Standardized patients, reimbursed on a daily basis, are used to train second-year students in the male genital and the female pelvic/breast examinations. Each student encounters four such patients during a six-week period.
- A required objective structured clinical examination (OSCE) using standardized patients, to be given at the end of the eight-week ambulatory primary care rotation in the third year, is under development.
- Third- and fourth-year students serve as standardized patients in a second-year OSCE designed to give students feedback about their performances.
- Standardized and paid patients have been recruited to be examined by groups of up to four second-year students during a course on physical examination in the second year. They have been trained to give feedback to these students.

Application of Computer Technology

- It is recommended, but not required, that students have computers.
- Funds for purchasing a computer are included in the student financial aid package.
- A medical student computer lab with full-time technical support has been created. New lab and small-group space under construction will have ports for using laptop computers in didactic activities.
- Computer technology is used to present visual material in lecture and laboratory activities.
- Selected courses use Web pages in place of a traditional syllabus.
- A Web-based system to obtain student evaluation of clerkship experiences is under development.
- Hand-held computers are being used to keep logs of patients seen in our eight-week primary care rotation.
- Computers are being used to gather student feedback on required clerkships.
- A student-run site reviews the various clerkship venues.

Changes in Assessment

- Standardized patients are used in evaluations of physical examination skills and in the Introduction to Clinical Medicine course in the second year.
- Direct observation of students when examining actors and paid patients is part of the Clinical Medicine II rotation in the second year.
- An OSCE examination using third- and fourth-year students as patients and examiners is included in the second-year ICM course.
- An OSCE at the end of the year-three primary care clerkship is being developed. Successful completion of the OSCE will be a course requirement. Standardized patients will be used exclusively.

Clinical Experiences

- Clinical Medicine IV is a third-year required eight-week primary care course that is taught entirely in office and clinic settings.
- Other required clerkships typically are taught in hospital settings.
- Students who elect the Rural Physician Associate Program spend nine months during their third year in a rural primary care setting.
- Students in years one and two visit hospital wards, clinics, or physician offices as part of their course in physical diagnosis.

Curriculum Review Process

- A major review of the primary competencies expected of all graduates was completed in 1999.
- The review was conducted by a committee of faculty selected by the senior associate dean for education. The committee included representatives from the schools of nursing, public health, pharmacy, and dentistry.

- The committee identified eight areas in need of additional attention in the curriculum. These were communication and interviewing skills, cultural competence, ethics, evidence-based medicine, health care delivery systems, informatics, interdisciplinary teamwork, and preventive medicine. Content relevant to these competencies was to be integrated into the existing curriculum using problem- and case-based methods without adding substantial curriculum time.
- The Education Council adopted the report of the committee and its recommendations.
- For each of the deficiency areas, the Curriculum Committee (membership consists of the directors of all required courses) constituted a steering committee charged with coordination of curricular design, faculty development, and evaluation of progress in the designated areas.
- Currently, a steering committee coordinates the efforts of these eight committees. Two additional areas have been added: end-of-life care and investigative medicine.
- The Education Council has been charged by the dean with developing a method to review the entire curriculum, to conclude with a faculty retreat in 2001. Plans to initiate this review are ongoing.
- The Curriculum Committee has proposed the following plan for a review of all years of the curriculum. Approximate times for completion are indicated in parentheses.
    - Step 1: The Curriculum Committee Executive Committee will gather the following reports and information, review them and categorize all the recommendations made:

—Year one review	In progress
—Year two review	Complete
—Years three and four self-study	In progress
—Primary Care Education Committee report	Complete
—Cultural Competence Committee report	Complete
—Strategic Plan Education Work Group report	Complete
—Report from year two course director's retreat, 1997	Complete
—Graduation Questionnaire summaries	Complete
—Year one end-of-year survey summaries	Complete
—Year two end-of-year survey summaries	Complete
—LCME reports from recent site visits	Complete

    - The group will also gather curriculum information from other top medical schools, especially ones that have experienced recent curriculum revisions. Recent graduates will be surveyed about the curriculum and suggestions for change. (Mid-summer 2000)
    - Step 2: After Step 1 has been completed, the Curriculum Committee itself will serve as the review committee for the entire curriculum. They will meet, discuss, and prioritize the recommendations and will prepare proposals for implementation. This will be done with input from both the UMD Medical School faculty and medical students. (Fall 2000)
    - Step 3: The Curriculum Committee will prepare a report and forward it to the Education Council, which will discuss the report and organize an all-faculty retreat. The purpose of the retreat will be to give faculty the opportunity to discuss the recommendations and plans for implementation. (Winter 2001)
    - Step 4: After final approval of recommendations by the Education Council, the Curriculum Committee will be responsible for implementation. (Fall term 2001, or earlier)
    - Course directors are charged with reviewing the content and methods of instruction on a yearly basis.
    - Review of the subjects covered, the times allotted, and the methods used to integrate the curriculum are the purview of the Curriculum Committee and the Education Council. When these groups identify a need for significant change, an ad-hoc committee of faculty is convened to review the educational program. This process usually takes place over a two-year cycle and has historically occurred at intervals of ten to 15 years.

The University of Mississippi School of Medicine

HELEN TURNER, MD, PHD

Curriculum Management and Governance Structure

- A formal systematic approach was put in place in 1990.
- Management involves
  - the Office of the Associate Dean for Academic Affairs
  - the Curriculum Committee
  - the Evers Society—a student-led group formed to evaluate the curriculum and to identify excellence in teaching
- The management group
  - evaluates curriculum
  - recommends improvements
  - monitors changes
  - conducts follow-up evaluations to promote continuous improvement of curriculum
- Individual course reviews utilize NBME subject examinations, USMLE scores, student evaluations, and course directors' identification of strengths and areas for improvement.
- A database is being developed to use as an integrative tool for curriculum assessment.
- Changes are recommended to the school of medicine executive faculty and the vice chancellor and dean for approval.
- Changes are based on ongoing review of the curriculum.

Office of Education

- There is no separate office of education in the medical school.
- The medical center has a Department of Institutional Research with responsibility for instructional development, evaluation, computer labs, training, and institutional research. The center staff work with all faculty on the health sciences campus.
- The department was established in the early 1980s as the Department of Instructional Development and Evaluation; its name was changed to Department of Institutional Research in 1988.
- In the last decade, the department has greatly expanded its training programs in computer technology and offers faculty programs to improve teaching skills.

Budget to Support Educational Programs

- A discrete budget assigned to support the Department of Institutional Research provides services in support of the educational program.

Valuing Teaching

- The Evers Society annually elects and honors five basic and five clinical science "all-star" teachers as well as one basic science and one clinical science Professor of the Year.
- Members of Alpha Omega Alpha elect and honor a Professor of the Year.
- The University of Mississippi Alumni Association's Medical Alumni Chapter sponsors awards for preclinical and clinical Professors of the Year.
- Students may nominate faculty members for the Golden Apple Award sponsored by the American Medical Student Association (AMSA) and the by American Medical Association Medical Student Section (AMA-MSS).
- Faculty may be honored in the medical student yearbook, *The Medic*.

CURRICULUM RENEWAL PROCESS

- The curricular change process was begun in 1995–96. Its goals were
  - Increased emphasis on primary care and ambulatory care in the clinical years
  - Improved integration of curricular content across disciplines within each year and across the four years (horizontal and vertical integration)
  - Decreased number of lecture hours in the curriculum and increased active learning opportunities
- The curriculum committee and its subcommittees were reorganized
  - The Curriculum Development Subcommittee was established to study curricular content across the four years.
  - The Curriculum Evaluation Subcommittee was established to study methods of student and course evaluation across all four years.

- The Steering Committee was created, consisting of the associate dean for academic affairs, the chair of the Curriculum Committee, the chair of the Development Subcommittee, the chair of the Evaluation Subcommittee, and an education specialist to coordinate and monitor the activities of the two subcommittees.
- A course directors' group for years one and two and a clinical course directors' group were organized and charged to improve integration within the curriculum, to increase active learning and establish an assessment schedule.

Learning Outcomes

- Faculty have developed and approved learning objectives that encompass knowledge, skills, attitudes, and behaviors medical students must demonstrate as a requirement of the MD degree.
- These outcomes are disseminated to faculty and students through the medical center bulletin, in the school of medicine handbook, and in discussions with students at orientation and class meetings. [The list of these outcomes is available from the author.]

Changes in Pedagogy

- Since 1995, progress has been made in increasing active learning opportunities within the medical curriculum.
- In years one and two, both total hours and number of lectures have been reduced.
- The reduction in lectures has been accompanied by an increase in small-group discussions, computer-assisted learning, and self-directed learning.
- Case discussion are used throughout the education program to introduce clinical concepts to students and to facilitate integration of learning across years and disciplines.

Application of Computer Technology

- Medical students are not required to have computers; a special low price is offered to students who have computers, from a local provider, allowing access to medical center educational resources.
- Students have access to 70 network computers available in four laboratories with e-mail, Microsoft Office 95, the Internet, and a variety of software required in various classes; they can print out handouts delivered by e-mail days prior to class.
- In the first year, physiology, anatomy, and academic information services courses require use of specific software. Course directors in biochemistry and Introduction to Clinical Medicine assign projects requiring students to perform Medline searches and access library journals using skills developed in the Introduction to Library Science course.
- In the second year, several classes distribute lecture and pretest material via e-mail and departmental Web sites.
- Many faculty use e-mail and Web sites to distribute lecture materials.
- Students in years three and four on ward rotations in clinical medicine are encouraged by their attending physicians to search Medline and read online journals.
- Courses in computers in medicine offer fourth-year students opportunities to develop skills in creating paper and virtual presentations.

Changes in Assessment

- The Executive Faculty Committee approved a uniform instrument for assessment in all clinical courses of students' knowledge, skills, behaviors, and attitudes. The items assessed correspond to the medical school objectives.
- The Department of Institutional Research is collecting data from the new standardized evaluation form to evaluate inter-rater agreement of faculty across clerkships.
- Faculty observation is the most commonly used method for the assessment of clinical skills.
- To complete the Introduction to Clinical Medicine course, every student is required to demonstrate competency in obtaining a history, performing a physical examination, and formulating an initial assessment under the direct observation of a faculty preceptor.
- In the third-year family medicine clerkship, students must complete an OSCE using standardized patients.
- In the fourth year, all students are required to demonstrate proficiency in clinical skills under the direct observation of an attending faculty member during a medicine inpatient course.
- Computer testing is not done currently except in individual cases of self-assessment and for students completing USMLE Step 1 and Step 2.

Clinical Experiences

- In year one, students may work with clinical mentors and participate in summer preceptorships in the medical center or in physicians' offices.

- In year two, students work with clinical preceptors in the Introduction to Clinical Medicine course and see both inpatients and clinic patients.
- In year three, during the required family medicine clerkship, each student spends four weeks with a clinical faculty member outside the medical center, usually in a rural setting. Two additional weeks are spent with family medicine faculty and residents in a private affiliated hospital in the city.
- In other third-year clerkships, students rotate through inpatient services, clinics, and private physicians' offices.
- In year four, students may take as many as two extramural rotations for credit outside the institution. Students may take electives in the Department of Emergency Medicine (adult or pediatric) or the neonatal, pediatric, surgical, or medical intensive care units.

Curriculum Review Process

- Evaluation of curricular changes made since 1995 includes
    - Student performances on standardized examinations
    - Student satisfaction with the curriculum as reported on internal surveys and the AAMC Graduation Questionnaire
    - Satisfaction of graduates and residency program directors with the preparation of students for the practice of medicine

Future Goals

Major issues the school will review in the next five years include:

- The increasing role of technology in medical education
- The need to maintain the patient base in ambulatory and inpatient areas for optimal clinical experiences
- The need to maintain volunteer faculty who afford students opportunities for clinical experiences in rural and underserved areas
- The need to enhance faculty development in all departments
- Utilization of data regarding student performance to improve evaluation and to enhance instruction

University of Missouri—Columbia School of Medicine

MICHAEL HOSOKAWA, PHD

Curriculum Management and Governance Structure

- A Curriculum Board has oversight responsibility for the curriculum.
- The nine members of the board are elected at large by the faculty. Candidates must declare their interest and provide position statements. Members serve three-year terms and may be re-elected for a second term.
- In addition to the nine faculty, a student representative from each class is elected to the board.
- The associate dean for medical education is a non-voting member.
- As part of the new curriculum implemented in 1993, the Office of Medical Education was created with the associate dean for medical education, assistant dean for student programs, and assistant dean for curriculum.
- The Office of Medical Education shares responsibility for the medical student curriculum with the Curriculum Board.
- The Curriculum Board is the oversight faculty committee responsible for policy.

Office of Education

- The Office of Medical Education was created with the development of the new curriculum in 1993.
- The office and the Curriculum Board share responsibility for the medical student curriculum.
- The office is responsible for the day-to-day administration of the curricula.

Budget to Support Educational Programs

- The Curriculum Office within the Office of Medical Education has four budgets:
  - Salary and wages for the assistant dean for curriculum and a staff of five
  - A curriculum office budget for supplies, equipment, educational materials, library purchases, duplication, consultants, meetings, and travel.
  - An educational software budget.
  - A Curriculum Incentive Fund to provide financial incentives to departments for the participation of faculty.
- All budgets come directly from the dean.

CURRICULUM RENEWAL PROCESS

- The rapidly changing biomedical sciences knowledge base has made it impossible to educate future physicians in the traditional manner. In 1988, a new dean described the University of Missouri—Columbia School of Medicine curriculum as, "A perfectly preserved 1960s curriculum." This set in motion a series of faculty discussions and initiatives to change the curriculum, taking advantage of recent trends in medical education. A faculty task force recommended
  - a curriculum emphasizing problem solving rather than memorization
  - self-directed and collaborative learning
  - de-emphasis of lectures and passive learning
  - early experience in patient care through introductory clinical experiences in the first year
  - development of skills in effectively using information technology
  - teaching in a way that simulates how physicians practice
  - learning basic sciences in the context of clinical medicine
  - reinforcing the basic sciences throughout the four-year curriculum
  - evaluation strategies that reflect the methods of learning
  - sharing responsibility for the administration of the curriculum between the faculty and the dean's office

Learning Outcomes

- As part of the complete curricular revision, an extensive set of basic sciences objectives was developed by the faculty.
- These objectives are apportioned appropriately through the first- and second-year PBL curricula and serve as the learning outcomes.
- The Curriculum Board developed a set of Clinical Exit

Objectives that guide the clinical curriculum. [Both of these extensive lists are available on request.]

Changes in Pedagogy

- As part of the complete revision of the curriculum, the first- and second-year curricula feature small-group learning and PBL.
- The core learning experiences are PBL-based and lectures on basic concepts supplement the PBL.
- Students have clinical experiences beginning in the first year as a shadowing experience with faculty and community physicians.
- Standardized patients are used for assessing the development of clinical skills.

Application of Computer Technology

- Students are not required to own computers; however, all students are trained to use computers during the new student orientation.
- The Integrated Technology Services group that provides and coordinates all computer technology serves the Health Sciences Center. A part of this service includes servers designated for educational programs, student e-mail, access to the Internet, and library services.
- First- and second-year students have eight-person study carrels in meeting rooms especially constructed to serve the PBL curriculum.
- Each of the 24 meeting rooms has a computer terminal networked to the library, the Health Sciences Center, and the Internet.
- The student lounge and hospital wards have computers for third- and fourth-year students.
- Prior to advancing to the third-year clinical blocks, students must take a training program and demonstrate competency in using computerized patient records.

Clinical Experiences

- Students have clinical experiences beginning in the first year as a shadowing experience with faculty and community physicians.
- During the two months between the first and second years, students have the opportunity to have a two-month rural community experience sponsored by the community hospital and the local Area Health Education Center (AHEC) or a one-month internal medicine community experience sponsored by the American College of Physicians.
- The third- and fourth-year clerkships have increased ambulatory experiences.
- A rural-track experience is available to students interested in taking three to five of their two-month core clerkships in a rural community hospital.

Curriculum Review Process

- The curriculum is under continuous review.
- Block evaluations are forwarded to the Curriculum Board for review and recommendations.
- A computer-based evaluation program being developed will allow students to evaluate basic science blocks and clinical blocks online and will allow data to be analyzed longitudinally.
- The use of external reviewers has proven helpful in getting a different perspective in the curricular review process.
- Having two leaders in medical education serve as external reviewers/consultants has provided valuable information for the dean's office.

University of Missouri—Kansas City School of Medicine

LOUISE ARNOLD, PHD, LELAND GRAVES III, MD, BETTY M. DREES, MD,
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Curriculum Management and Governance Structure

- A Council on Curriculum has centralized responsibility for the design, management, and continuous quality improvement of all curricular experiences leading to the MD degree.
- The council consists of elected student members plus elected faculty who represent the basic sciences, clinical medicine, and the humanities and social sciences.
- The council forwards its decisions as recommendations to the chief executive committee of the school, composed of elected and appointed members representing all the major councils at the school and educational representatives from the affiliated teaching hospitals.
- After review and discussion of Council on Curriculum recommendations, the executive committee passes its decisions on to the dean of the school for final action.
- A Curriculum Evaluation Committee has responsibility for designing and implementing ongoing curriculum evaluation and for reporting results of its analyses back to the Council on Curriculum, to the executive committee, and to the dean.
- The curriculum governance structure has undergone major change in the past few years.
- With the development of a Department of Basic Medical Sciences in the School of Medicine in 1997, the Council on Curriculum assumed oversight for the basic sciences as well as the clinical science, behavioral science, and humanities curriculum leading to the MD degree.
- To expedite review and renewal of the basic science courses, the Council formed an ad-hoc committee composed of representatives from the basic sciences and clinicians on the council.
- Making the Curriculum Evaluation Committee a standing committee of the executive committee chaired by the associate dean for academic affairs has strengthened its role in curriculum renewal.
- To ensure timely and broad curriculum evolution, the number of Curriculum Council members has just been reduced. Still representative of the major disciplines and still an elected body, the Council on Curriculum is to function as a working group under the leadership of its chair to continue curricular revision and renewal.

Office of Education

- There is an office of medical education and research that was established when the school opened in 1971. Its functions have varied through the years.
- Conducting institutional research, program evaluation, and more basic studies in medical education have been its major formal responsibilities in the recent past.
- Currently, the office has been more directly charged with faculty development. It has also been more closely aligned with the Council on Curriculum to support curricular renewal, while it continues its evaluative and research functions.

Budget to Support Educational Programs

- There are purchased teaching time contracts between the school and the faculty practice plan and between the school and its hospital affiliates.
- These contracts outline the types and amounts of educational services to be purchased by the school to implement its undergraduate curriculum.
- The funding comes from the state-supported university.
- The practice plan and the hospitals augment the funding, however.

Valuing Teaching

- Central to the approach to medical student education at the University of Missouri—Kansas City since its inception in 1971 has been the docent concept of education.
- In each year of the six-year program, students have been assigned to docent teams headed by physician–scholars called docents.
- Year three through year six docents work with teams of 12 students during a two-month annual internal medicine inpatient rotation and during weekly longitudinal ambulatory care clinic sessions.
- The job description of these docents encompasses a variety of roles beyond teacher, including evaluator, parent figure, mentor, and adviser.

- These docents have typically been members of the Department of Internal Medicine, which has been responsible for selecting internists to fill the docent role. Self-selection also plays a part in deciding who becomes and continues to be a docent.
- An important step forward in encouraging faculty to excel in educator roles has been the recent revision of promotion guidelines.
- The key to the revision has been the expansion of the definition of scholarly activity to include teaching.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- One of the themes of the school's ongoing renewal of its curriculum is the development and implementation of a competency-based curriculum so graduates have not only the knowledge needed to undertake the next step of their medical education but also the capacity to put their attitudes, knowledge, and skills into action in the supervised practice of medicine.
- The nine competency areas are effective communication; basic clinical skills; using basic science in the practice of medicine; diagnosis, management, continuing care, and prevention; lifelong learning; self-awareness, self-care, and personal growth; the social and community contexts of health care; moral reasoning and clinical ethics; and problem-solving skills.
- The competency areas were adapted from the Brown University School of Medicine's Blueprint for Medical Education.
- The areas are codified in UMKC's *Experience-based Curriculum Guide*, which specifies the levels of competency students are expected to acquire by the ends of major curricular blocks and by graduation.
- Through formal and informal instruction and repeated clinical experiences, students are expected to progress from the ability to gather data from a variety of sources to the ability to apply information to define clinical problems, and finally to the ability to solve clinical problems.
- Competencies involve not only technical and scientific knowledge and skills but also knowledge, skills, and attitudes related to integrity, compassion, altruism, and dutifulness.
- Plans for all of the basic science courses and clinical clerkships are under revision to implement the competency-based curriculum.
- Each course and clerkship will indicate in its goals and objectives which of the competencies will be taught and assessed. When completed, the curriculum will reflect where all of the competencies are taught and assessed.
- The process of adopting the competencies was suggested by the Office of Medical Education and Research in preparation for a 1997 accreditation survey.
- Leadership for adapting and approving the competencies came from the chair of the Council on Curriculum, with input from the faculty and the student body.
- On recommendation of the Council, the school's executive committee considered the competencies and recommended them to the dean, who gave final approval.
- Over the past 18 months, the Council on Curriculum compared the competencies with the MSOP's objectives and concluded that there was a close correlation between the local and national expectations for student learning.
- Assuring that learning experiences are available so students can acquire and demonstrate these competencies is an important ongoing task of the Council on Curriculum.

Changes in Pedagogy

- Since the school began in 1971, each student has been part of a small group led by a physician–scholar called a docent. First and foremost, the small group is a learning community. The docent groups, composed of students in years three through six, also serve as health care teams, assigned to patient panels in continuity clinics and inpatient wards in internal medicine. These small groups continue to be key to the medical student education program at the school.
- The recent increase in small-group work has occurred in basic science courses, notably histology, medical microbiology, and pathology.
- Another component to the school's longstanding approach to medical student education has been the concept that the patient is the textbook. Thus, within the context of the docent teams real patients have been used to introduce, reinforce, and refine concepts for students.
- A recent pedagogic change in the use of cases has taken place in several basic science courses, where computerized and paper cases are now used.
- Simulated cases are also used on some docent teams to ensure breadth in students' experiences with a specified patient mix.
- Standardized patients have been used in experimental studies designed to teach communication skills to medical students.

- Drama students have been trained to present difficult communication scenarios to students before they undertake family medicine preceptorships in rural communities.

Application of Computer Technology

- Presently, students are not required to have their own computers. However, students have access to computers in various locations on the university's main campus and in the medical school.
- For the past 25 years, a comprehensive item bank of questions has been available for students for self-assessment via computerized technology.
- The bank forms the basis for the Quarterly Profile Examination and tests students' acquisition and retention of major concepts and information in the basic, behavioral, and clinical sciences.
- Students have confidential access to their individual performance profiles via the school's Web page, along with current bibliographic material supportive of correct answers to the questions on the tests.
- Computer technology is an integral part of instruction in a required introductory biostatistics course; in several basic science courses such as physiology, histology, and medical microbiology where small-group work centers around interaction with CD-ROM programs; in required therapeutic pharmacology courses exclusively delivered in self-paced format via the Web; and in clinical clerkships and rotations where computer technology is integral to patient care and information retrieval.
- Additional ways to use computer technology in the educational program will constitute an important part of ongoing curricular renewal.

Changes in Assessment

- The student-assessment system is being revised in order to gauge whether students have acquired the specific competencies listed in the curriculum guide.
- Faculty observations of student performances in courses and clerkships will be more structured and closely tied to the competencies.
- A problem-solving skills examination is being developed, and an OSCE is being expanded to assess clinical examination skills not only at the close of an introductory clinical skills course but before students commence their clerkship years.
- The school continues to use the Quarterly Profile Examination, which is a comprehensive test of students' acquisition and retention of basic, behavioral, and clinical science facts and principles.
- The school requires that students pass the USMLE Steps 1 and 2.
- Currently, the school does not use standardized patients or computers for any of its *major* tests. However, teaching associates are used in obstetrics–gynecology to teach the pelvic and breast examinations, and computer testing, such as clinic tests in ambulatory settings, does occur in several courses and clinical rotations.

Clinical Experiences

- Beginning with the first week of the six-year combined baccalaureate–MD degree program, UMKC's medical students interact with patients.
- As members of a year-one docent group, students take an Introduction to Medicine course led by a docent whose patients constitute the major part of this experience. These docent groups are located in community hospitals.
- The docent program continues in year two with an Introduction to the Child course set either in a community hospital or in a pediatrician's office and then with an Introduction to the Woman course located in a community hospital.
- In years three through six students attend a longitudinal ambulatory care clinic in a community hospital one-half day per week.
- The family medicine preceptorship places students in the offices of family practitioners in rural communities for a month. The family medicine clerkship takes students into community, school, and city health department clinics.
- Required clerkships are located in community hospital wards, but each of them has an ambulatory care assignment, albeit hospital-based, as a significant part of the experience.

Curriculum Review Process

- The themes and goals of curricular renewal are to:
  - Enhance integration of teaching and learning in the basic sciences, clinical medicine, social sciences, and humanities throughout a combined baccalaureate–MD degree curriculum,
    —increasing the relevance of basic science teaching to clinical medicine, and

    - —continuing early involvement of students in health care
  - Achieve a competency-based curriculum so graduates have not only the requisite knowledge to undertake the next step of their medical education but also the capacity to put their attitudes, knowledge, and skills into action in the supervised practice of medicine
  - Promote active learning
  - Implement a student-assessment system that reflects specified competencies
- The design and strategies used in the school's curricular renewal effort entailed the following steps:
  - Identify and approve competencies that students must acquire by the ends of major curricular blocks and by graduation
  - Centralize responsibility for curriculum in the dean's office
  - Restructure course sequences in the third and fourth years of the six-year curriculum to increase student exposures to selected basic science instruction while increasing efficient use of faculty resources and the potential for integrating across the basic and clinical sciences
  - Revise contents and renew formats of third- and fourth-year basic science courses
  - Analyze the "old" curriculum for the presence of learning experiences that enable students to acquire the specified competencies
  - Analyze current student assessment procedures to demonstrate that students have acquired the specified competencies
  - Develop and implement additional learning experiences necessary for students to achieve competencies not represented in the old curriculum
  - Develop and implement new student-assessment procedures to certify students' competence
  - Reorganize ambulatory experience for students and faculty
  - Implement revised third-year courses
  - Collect outcome data for the revised third year
  - Revise the curriculum in light of outcomes
  - Continue ongoing regular review of the curriculum by using a continuous-quality-improvement cycle
- Planning resources that were needed were faculty time, administrative staff support, and the strengthening of faculty development for their educator roles.
- Implementation resources needed also involved faculty time dedicated to teaching and administrative staff support.
- Funding for increased use of educational technology and for evaluation of changes continues to be needed.
- Challenges of the curricular renewal process are numerous.
- It is important but at times difficult for faculty to have the capacity to view the educational process as a whole, rather than as discrete units offered by individuals under departmental auspices.
- Increasing time demands on faculty to perform clinical services makes carving out time for curriculum renewal and development problematic.
- Identifying additional funding for educational needs, particularly information technologies and their maintenance, is also challenging.
- The plan for evaluating the curricular changes is comprehensive, entailing introduction of new process and outcomes measures plus continued use of process and outcomes measures already in place.
- The new measures include an index of the clinical relevance of revised basic science courses, faculty and student perceptions gathered in focus groups and town meetings, the NBME's basic science examination, an OSCE, and a test of clinical problem solving.
- Measures already in place include student perceptions of instruction gathered through revised course-evaluation forms and through the AAMC Graduation Questionnaire, a computerized record of the numbers and types of patients students see via computer, attrition and extension rates, grade distributions in revised courses, Quarterly Profile Examination results, faculty ratings of students' clinical performances, scores on USMLE Steps 1, 2, and 3, results of surveys of graduates' perceptions of medical school education, and evaluations of clinical performances in residency.
- The Council on Curriculum conducts a biennial review of each required course and clerkship that leads to regular renewal of course content, teaching methods, and opportunities for increased horizontal and vertical integration. Data are provided from internal and external sources. The internal sources include student performances on local tests and examinations, including the Quarterly Profile Examination, student and faculty perceptions of the strengths and weaknesses of the courses and clerkships, and departmental assessments of courses or clerkships. External data sources are student performances on NBME shelf examinations; USMLE Step 1, 2, and 3 performances; responses to the AAMC Graduation Questionnaire; opinion surveys of graduates in practice; and surveys of the performances of graduates in postgraduate training programs.

Future Goals

- Issues that will be at the forefront of curricular renewal include: continued analysis of the curriculum for learning experiences related to the acquisition of each of the nine competencies; increased integration across the basic science courses; increased clinical correlation within the basic science courses; enhanced opportunities for active learning including the use of information technology; implementation of a geriatrics and end-of-life curriculum; design and implementation of extended docent rotations into rural and urban community settings; and improved assessment of the skills and attitudinal dimensions in the nine competency areas.

Saint Louis University School of Medicine

ALBERTO GALOFRE, MD, AND GAIL FURMAN, PHD

Curriculum Management and Governance Structure

- Since 1996, the Curriculum Management Committee (CMC) has been in charge of planning, organizing, and evaluating the curriculum for the MD Program.
- The CMC is chaired by the associate dean for curriculum and consists of selected faculty and students.
- Faculty are chosen for their dedication to teaching and ability to view educational issues from an institutional perspective.
- Students are selected from those expressing interest in serving.
- Under this committee are phase coordinating committees for three curricular phases.
- The coordinating committees are made up of the unit and course directors for the phases. The coordinating committees are in charge of phase issues.
- Two supporting committees are the Program Evaluation Committee and the Educational Technology Committee, which report to the CMC.
- The dean chairs the Curriculum Oversight Committee (COC), which consists of several senior faculty members.
- The COC approves general education policies and supervises the actions of the Curriculum Management Committee.
- Prior to this central curriculum governance, an Educational Policy Committee was the sole curriculum committee. It consisted of representatives from all departments and all student classes. At that time, the curriculum was departmentally based.

Office of Education

- An Office of Educational Support (OES) was established in 1998 as part of the Office of Curricular Affairs to help faculty improve instruction and evaluation and to support the faculty in implementing the changes required by the new curriculum.
- The OES currently consists of three educators headed by an associate dean. This professional staff is supported by clerical staff.
- OES responsibilities include developing, managing, and evaluating the curriculum, faculty development, student evaluation, and educational research.

Budget to Support Educational Programs

- An education budget was initiated in July 1998.
- The education budget consists of two main components: an allocation to departments based on relative teaching effort within the MD program, and a budget for each of the three curricular phases.
- These budgets support essentially all teaching activities for the MD program.
- Departmental allocations are calculated with a method that assigns relative units (RUs) to all instruction in the MD program. For example, each course is assigned a number of units based on its length and complexity. Also, when available, a quality measure is introduced that adds units to the base number. Units are then assigned to departments based on relative effort within each course. All units are calculated at the end of an academic year.
- The dean has assigned a pool of dollars that covers all teaching done by the faculty.
- Based on the total RU for each year and the money available for distribution, a dollar value is assigned to each RU. Departments than are assigned dollars for distribution for the next budget year to cover all teaching done by each department.
- The fund that supports teaching was established by the dean with a mix of available dollars and new dollars from an endowment fund established for the School of Medicine.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Educational goals were written as guidelines for developing a new curriculum. These goals are under constant revision (List 1).

LIST 1. Educational Goals of the MD Program

During their four years of study, students in Saint Louis University School of Medicine's MD degree program are expected to achieve three goals set for them by their faculty. Students are to acquire a strong foundation in the biomedical sciences, become skilled in the practice of medicine, and develop personal and professional attributes that ensure their continued commitment to high ethical and performance standards.

The first of these goals, the **acquisition of biomedical knowledge**, requires that students obtain:

1. An understanding of biomedical science sufficient to ensure that scientific medicine can be practiced and that scientific literature can be critically evaluated.
2. An understanding of the scientific method and of the process by which information derived from biomedical and clinical research is integrated into the practice of medicine.
3. A strong fund of knowledge about clinical medicine and the ability to organize, assimilate, and interpret new information and to apply it to clinical problems.
4. The skills needed to gain access to all available sources of new information about the biomedical sciences and clinical medicine.
5. A basic understanding of epidemiologic principles and the role of epidemiology in public health problems and in the diagnosis and treatment of the individual.

The second goal, **becoming skilled in the practice of medicine,** requires that students acquire:

1. A comprehensive understanding of the roles of the medical history, the physical examination, and laboratory tests in the diagnostic process and in the treatment of the patient.
2. The skills required to obtain information from patients and their families, to discern its accuracy and relevance, and to use that information in diagnosis and treatment.
3. The skills required to obtain accurate and relevant information from physical examination of the patient.
4. The ability to make decisions regarding patient care in an efficient, cost-effective, and timely manner and to assess the impacts of treatment plans.
5. The ability to recognize risk factors and to provide preventive measures that reduce the incidence and severity of disease.
6. The ability to assess the health care needs of society and to provide leadership in the development of effective systems for health care delivery.

The third goal, **adhering to the high ethical and performance standards of Saint Louis University,** requires that students of the School of Medicine develop:

1. Interpersonal skills that enable them to provide information and comfort to patients and their families.
2. Attitudes that foster mutual respect for and collaboration with other health care professionals.
3. A commitment to professional excellence, including accepting the responsibility for ongoing self-education and for critical evaluation of one's own performance and that of one's peers.
4. Personal attributes such as compassion, honesty, integrity, respect for others, and social responsibility, which are essential to the healing process in a diverse and changing society.
5. An appreciation of the appropriate and humane use of experimental animals in medical research.

Changes in Pedagogy

- The new curriculum has reduced the number of lectures and contact hours. The process to increase unscheduled time continues.
- There has been a steady effort to increase use of small-group instruction. To facilitate this process, 24 new small-group rooms have been built during the last four years.
- Standardized patients (SPs) are used throughout the curriculum for instruction and assessment.
- During the first two years, SPs and teaching associates are used to teach and evaluate history taking and the complete physical examination.
- During the clinical years, SPs are used during the teaching of some finer points in psychiatric cases by portraying "difficult patients" to help students learn how to manage such situations.
- SPs are used to evaluate student performance throughout the clinical years.

Application of Computer Technology

- Students are not required to own computers, although most do.
- During the last four years there has been a significant increase in the use of computers and multimedia for instructional purposes.
- A new Instructional Technology Center (ITC) provides students with access to the Web and to multimedia used in courses.
- The ITC is designed to aid faculty in developing computer-based instructional materials.
- All small-group rooms are equipped with computers and large-screen monitors for student use.
- Currently, all courses are developing a Web presence using WebCT as their platform. WebCT is a commercial software program that allows faculty to provide course support to students.

Changes in Assessment

- Saint Louis University collaborates with the National Board of Medical Examiners (NBME) as a pilot site helping to develop clinical testing methods.
- During the first two years of the curriculum, SPs evaluate students' history-taking and physical examination skills.
- During the third year, objective structured clinical examinations (OSCEs) are used during the psychiatry and

obstetrics–gynecology clerkships at the end of each rotation as part of the final examination.

- Before starting the last academic year, all students undergo a rigorous ten-station exam using SPs.
- Recently, computerized testing has been introduced in a few units during the first two years using WebCT software.
- Students are observed by faculty and residents while on their clinical rotations.
- Clerkships use a standard evaluation form, and feedback to students is required halfway through the longer clerkships.
- Faculty observe and assess students' performances during tutorial sessions while the students manage problem cases during the first two years. The faculty-assigned score is weighed significantly toward the final course grade.

Clinical Experiences

- Students are offered a variety of sites for their clinical experiences. They still receive much of their training within hospitals, but there has been a gradual and significant shift to ambulatory care facilities.
- During the family medicine clerkship, all of the instruction takes place in outpatient facilities, using mostly community-based preceptors.

Curriculum Review Process

- The latest major curriculum review began in 1995.
- Hundreds of faculty and students—aided by staff, alumni, and others—conducted an intense review of the traditional curriculum.
- This review culminated in a blueprint for improvement, "Curriculum Renewal: A Plan for Change," which was published in October 1995.
- Using this blueprint, design committees were organized to study curricular governance, content selection and curriculum design, educational strategies, evaluation of students and programs, and faculty development to improve instruction and evaluation.
- Starting in March 1995, meetings and surveys provided material for a thorough diagnosis of the curricular areas needing improvement. Design committees then met once or twice a month and proceeded to develop the new curricular architecture around a hybrid mix of lectures and small groups.
- The curriculum was centralized around subjects rather than departments; an organ and systems approach was used as an organizing principle for the second year.
- The dean provided the necessary resources for the new curriculum, including new construction of small-group rooms and purchase of additional multimedia equipment.
- The dean also provided the resources for an education budget to support the centralized curriculum governance.
- The new curriculum was inaugurated in the fall of 1997.
- Consequently, the 2001 graduating class will be the first class to have undergone the full new curriculum. Changes are made continuously after feedback from program evaluation is analyzed.
- The main challenges were the usual ones found in most change processes.
- Two salient issues were resistance by some faculty and chairpersons faced with a centralized governance and some apprehension among students of the inaugurating class.
- A first comprehensive evaluation has been finalized, and changes are under way in the delivery of some units. Each year a comprehensive evaluation will allow tracking of curricular outcomes.

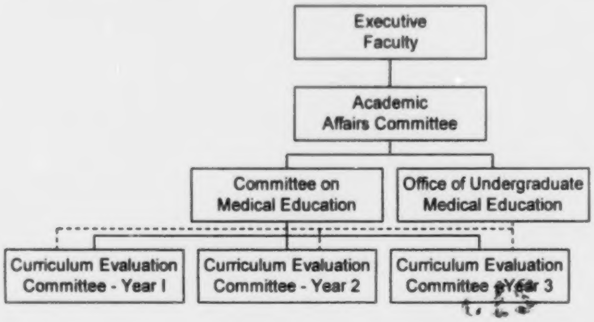
Washington University School of Medicine

ALISON WHELAN, MD

Curriculum Management and Governance Structure (See Figure 1)

- Central control of the educational effort is consolidated under the associate dean for undergraduate medical education.
- The Academic Affairs Committee (AAC) provides the link between the Office of Undergraduate Medical Education (OUME) and the Executive Faculty, the governing body of the school. The AAC deals directly with broad educational concerns.
- The AAC reactivated the Committee on Medical Education (CME) in 1998 to provide comprehensive curricular oversight.
- The CME is composed of representatives from the faculty, the student body, department heads, and the faculty at large. Its specific charge is to review the overall content of the medical education program. This includes the integration of courses within and across academic years, and the development of criteria, policies, and procedures for the evaluation of the curriculum and its individual courses and teachers.
- While the CME also is charged with reviewing the content and design of individual courses, the three curriculum evaluation committees described below are more directly involved in individual course evaluation.
- In 1999, the CME approved creation of thematic curriculum working groups as a means of enhancing curricular integration.
- The Curriculum Evaluation Committees for medical school years one, two, and three have existed since 1992. These groups are composed of course masters from the respective years, as well as other faculty, student, and administration representatives.
- The CECs meet on a regular basis to foster interdepartmental collaboration and faculty participation in development and oversight of the curricular revision process, and to discuss issues related to teaching, as well as student and course evaluation. (See Figure 1.)

FIGURE 1: Curriculum Management and Governance Structure


Executive Faculty
Academic Affairs Committee
Committee on Medical Education
Office of Undergraduate Medical Education
Curriculum Evaluation Committee - Year I
Curriculum Evaluation Committee - Year 2
Curriculum Evaluation Committee - Year 3

Office of Education

- In 1993, the Office of Medical Education was established and a new associate dean was appointed with responsibility for undergraduate medical education, graduate medical education, and continuing medical education.
- In 1997, this position was split and separate associate deans of undergraduate medical education and graduate medical education were appointed, and a vice chancellor/associate dean of continuing medical education and admissions was also appointed.
- The Office of Undergraduate Medical Education's responsibilities have grown over time. Its primary concerns have been curriculum management (i.e., coordination of curricular integration and review, provision of secretarial resources for curriculum committees, oversight of course scheduling, development and maintenance of a computerized curriculum database) and evaluation (of students, faculty, courses, and the curriculum as a whole), but are expanding to include faculty development in teaching skills.
- Other areas within the office's purview include career preparation and counseling, coordination of away electives for WUSM students, and planning for and maintenance of educational facilities.

Budget to Support Educational Programs

- The Office of Undergraduate Medical Education has always had a separate budget.
- Funds come through the dean's office as part of the dean's fund allocation, which is derived from tuition and fees,

outside funds, and a "dean's tax" imposed on medical school departments.

Valuing Teaching

- Educational activity is one component of promotion criteria in all tracks at the medical school.
- Recent changes in the curriculum and curricular oversight require increased faculty time, which poses a challenge, particularly given the concurrent constraints associated with changes in health-care financing.
- In recognition of the pressures on teaching, both the Executive Faculty and the Executive Committee of the Faculty Council (which represents the entire faculty) are actively engaged in evaluating the role of educational activities in promotion.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Educational objectives were developed in academic year 1997–98 by the Committee on Medical Education and approved by the Academic Affairs Committee of the Executive Faculty. [The list of objectives is available from the author.]

Changes in Pedagogy

- We have significantly decreased the total number of hours students attend classes during the first two years. In academic year 1999–00, total first-year class hours were 694.5, compared with 817 in academic year 1992–93; second-year class hours were 604.5, compared with 742 in academic year 1992–93.
- The reduction was accomplished by eliminating the redundancies in the traditional course material and by changing the lecture-intensive format to a combination of lecture and small-group learning activities. This has increased the time available to students for independent learning and enrichment.
- Patient cases are used in many of our courses to introduce and reinforce basic concepts to our students.
- Standardized patients are used in our Clinical Skills course, where students learn to do a complete physical diagnosis examination using a detailed protocol under the supervision of physicians, and in the sensitive exam sections of our Clinical Medicine course.
- Beginning in academic year 1998–99, OSCEs, using standardized patients, were introduced in the medicine clerkship; this will be expanded to additional clerkships in 1999–00 and 2000–01.

Application of Computer Technology

- Students are not required to have their own computers at WUSM.
- Computers are provided at various sites on campus, including hospitals, and can be accessed from remote sites (i.e., home by modem), and each student has his or her own password for accessing all educational materials.
- On-line intranet curriculum support is provided through a standard software application that includes on-line course materials (objectives, syllabi, etc.) for most courses as well as capabilities for discussion, databases, and student self-assessment.
- The school has developed a computer-based system for course evaluations and is developing a scheduling database.
- Students and faculty rely on e-mail for both formal and informal communication about courses and course material.
- Instructors use a variety of computer-aided instructional tools as part of their courses, including radiographic teaching programs and case studies developed at WUSM and supplemental software packages. [Information about these packages and all software used is available from the author.]
- A state-of-the-art patient simulator in the Department of Anesthesiology is utilized in the clerkships.
- The curriculum includes instruction and practice in accessing, interpreting, and manipulating biomedical information, including utilizing on-line medical searches in first-year orientation, utilizing biomedical information databases of nucleic acids and amino acid sequences in the Medical Genetics course, interpreting clinical studies and manipulating clinical research databases in the Clinical Epidemiology and Medical Biostatistics course, and advanced medical literature searches and evidence-based medicine in the medicine clerkship.

Changes in Assessment

- Standardized patients have long been used for the sensitive exam in clinical medicine.

- In 1997–98, the use of standardized patients was broadened to include instruction and assessment of basic clinical skills.
- Beginning in academic year 1998–99, clinical skills assessment, using standardized patients, was introduced in the medicine clerkship; this will be expanded to additional clerkships in 1999–00 and 2000–01.
- It is anticipated that additional standardized patient experiences in communication skills will be implemented in academic year 2000–01.
- A few courses utilize standard computer software for assessment quizzes.
- Online graded quizzes are currently under development.
- OSCEs were introduced into the core medicine clerkship in academic year 1998–99 and will be fully integrated in all clerkships by academic year 2000–01.

Clinical Experiences

- Students' first contact with patients is in the first-year Clinical Medicine course with hospitalized patients.
- Plans to broaden clinical experiences in the first two years are under way (including home visits and visits to preceptors' offices in the first year) and are expected to be implemented in academic year 2000–01. This course continues through the second year as well.
- The third year is composed of required clinical clerkships: ambulatory care (choice of consult/liaison psychiatry, family practice or emergency medicine/urgent care), internal medicine, neurology, women's and children's health (obstetrics, gynecology, and pediatrics), psychiatry, and integrated surgical disciplines.
- Since 1990, a four-week ambulatory block (choice of consult/liaison psychiatry, family practice, or emergency medicine/urgent care), and a four-week ambulatory block in medicine have been added to the curriculum.
- The pediatrics, ob–gyn, and neurology clerkships have incorporated ambulatory experiences.
- For all of the rotations, identifying interested qualified preceptors is an ongoing challenge, although retention of preceptors has been very high.
- The fourth year is entirely elective, and students choose from a wide range of clinical, research, and special study electives.
- Clinical electives, which comprise approximately two thirds of all elective time, include a broad array of inpatient and ambulatory experiences; over the last decade, ambulatory experiences, either as primary care electives or as a component of subspecialty electives, have increased substantially.

Curriculum Review Process

- A curriculum revision process was undertaken during the 1996–97 academic year and implementation began during 1997–98.
- Since then, WUSM has adopted a continual revision process, which is managed by the Office of Undergraduate Medical Education and the curriculum committees discussed earlier and includes the development of curriculum working groups that focus on specific content areas.
- Process themes and goals
    - Medical biology—To prepare each student for the study of human health and disease by developing a core framework of knowledge and skills in biomedical sciences.
    - Human pathobiology—To prepare students for entry into lifelong learning about the pathobiologic basis of human disease and fundamentals of therapy.
    - Physicians, Patients, and Society—To prepare all students with the knowledge, skills, and attitudes for the clinical clerkship experiences and future careers as professionals.
    - Core clinical experiences—To provide didactic and experiential education in the knowledge, skills, and attitudes that will prepare graduates for the pursuit of excellence in practicing clinical medicine.
    - Selectives and electives—To provide flexible opportunities in the breadth and depth of medicine and science represented at WUSM.
- Design of process
    - A steering committee for the 1996–97 curriculum revision, composed of key faculty involved in education, was subsequently dissolved when the CME assumed guidance of an iterative revision process.
    - The CME has appointed several curriculum working groups to investigate in detail various areas of the curriculum. To date, working groups on doctoring, primary care, nutrition, and radiology have been formed and are in different stages of making recommendations to the CME regarding curricular revision.
    - Working group recommendations are taken to the appropriate year's Curriculum Evaluation Committee and to key stakeholders in the educational process, such as the chair of the Academic Affairs Committee (AAC) of the Executive Faculty.
    - The associate dean for undergraduate medical education orchestrates much of this process. The next stage involves a presentation to the CME. With the CME's approval, the proposal is then taken for ratification by the AAC.
- Planning resources needed
    - The greatest resource required during the planning

phases of the curriculum is faculty time. OUME office support is also needed.

- Implementation resources needed
  - Funding from the dean, increased administrative support, additional faculty and their time to teach more small-group sessions and to participate in curricular review and planning
  - Increased administrative support
  - Additional faculty members to teach more small-group sessions
  - Additional faculty time to teach more small-group sessions
  - Faculty development in teaching and information technology
- Challenges and unanticipated outcomes
  - Negotiating consensus among faculty regarding the need for change in content and teaching methods
  - Moving beyond departmental boundaries
  - Competing priorities for faculty time to teach
  - Ongoing evaluation and revision more acceptable than wholesale curriculum change
- Plans for evaluation
  - Course and faculty evaluations by students
  - Survey of WUSM graduates
- WUSM has adopted a continual revision process that includes the development of curriculum working groups that focus on specific content areas.
- Ongoing review of the educational program occurs at many levels. There is a sophisticated student-driven course-evaluation system that provides detailed and prompt course-specific evaluation.
- The CECs review each year of study. The CME is responsible for evaluating the educational program as a whole. In order to review particular areas of the curriculum in detail, the CME appoints curriculum working groups as discussed previously.
- The OUME provides to the curriculum committees summaries of course evaluations, the responses to the AAMC Graduation Questionnaire, student performances on USMLE examinations, and evaluations of graduates by residency directors.
- The school is completing a comprehensive review and update of the "doctoring" curriculum, which includes clinical and communication skills, medical economics, law and ethics, population and preventive medicine, epidemiology and medical biostatistics, professionalism, and lifelong learning. Integration will remain a constant focus.

Future Goals

- Future goals focus on expanding the use of information technology and encouraging scientific inquiry.

Creighton University School of Medicine

WILLIAM J. HUNTER, MD

Curriculum Management and Governance

- The Educational Policy Committee (EPC) was reformulated to be a smaller, more responsive committee. This committee is composed of six faculty (three basic science and three clinical members), the four component directors, four students (one from each class), and the associate deans for student affairs and medical education.
- The EPC defines the broad goals and objectives of the curriculum, coordinates and monitors faculty development, and analyzes and distributes data from the Evaluation Committee.
- The Component Directors Committee is made up of the four component directors and the associate dean for medical education.
- This committee defines the goals and objectives and teaching responsibilities for each component, develops an overall schedule, and coordinates exams and evaluations between components.
- The Component Committee for each year consists of the component director, course directors of that component, two students, and the associate dean for medical education.
- The Component Committees are responsible for the day-to-day administration of the curriculum. They define the goals and objectives and teaching responsibilities for each course, maintain the schedule, and coordinate the examinations and evaluations.
- The Evaluation Committee is made up of two faculty from the EPC, two faculty elected at large, two students (third-year), the associate dean for medical education, and the evaluation staff.
- This committee is responsible for evaluating the program as a whole, components, courses, and instructors, and recommends appropriate changes to the educational Policy Committee.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Develop self-directed learners who will continuously develop as caring physicians during graduate training and practice.
- Enable students to acquire a strong foundation in the basic and clinical sciences and in those aspects of the humanities and social and behavioral sciences that are relevant to medicine.
- Foster the development of the skills necessary for the competent practice of medicine throughout the student's professional career.
- Assist the student in developing an appreciation and understanding of the diverse values that are brought by health care professionals, patients, family, and society to the practice of medicine.
- Utilize methods in the curriculum that will be flexible in meeting the needs of the individual student. This curriculum will include a variety of learning strategies and formats.
- In 1990, Creighton University School of Medicine began an ambitious university-wide strategic planning process (Creighton 2000 Strategic Initiative), which noted the following strengths:
  - Tradition of excellent clinical teaching
  - High-quality medical students
  - Caring, committed faculty, staff, and administrators
- And identified the following weaknesses:
  - Strong independent departments that resist innovation, especially programs that cross traditional disciplines
  - Poor integration of clinical information into basic science years and basic science information into clinical years
  - A basic science curriculum largely composed of passive learning methods that did not enhance the student's self-directed learning, decision-making skills, and critical thinking skills
  - Little budget input for educational purposes and lack of staff to provide instructional support for teaching improvement
- This planning initiative recommended a comprehensive critical review of the entire curriculum, focusing on the following themes:
  - Integration of basic science and clinical medicine throughout the curriculum
  - Development of problem-solving skills and strategies for lifelong learning
  - Reassessment of course objectives and development of graduation objectives

- The timeline for the process is described below:
  - Planning for this review began shortly after the arrival of a new dean in the summer of 1992.
  - A Chair's Retreat in the spring of 1993 called for the introduction of active learning sessions at all levels of the curriculum and integration of basic sciences and clinical material at all levels of the curriculum.
  - A widely representative (faculty, students, and housestaff) Task Force on Curriculum Analysis and Revision was appointed early in 1994.
  - The task force was divided into four committees: Biomedical Fundamentals, Clinical Clerkships and Elective Programs, Evaluation and Curriculum Competence, and Introduction to the Patient.
  - These committees analyzed current curricular content and developed guidelines for a new, innovative curriculum.
  - By the winter of 1994, a general consensus had developed regarding the basic content and structure of the new curriculum.
  - Task Force subcommittees became the core of course and clerkship development committees.
  - The Educational Policy Committee approved a broad outline of the new curriculum in February 1995 and the Executive Committee approved the final curriculum in the summer of 1996.
  - Component I of the new curriculum was implemented in the fall of 1996.
  - Components II and III were initiated in the summer of 1997 and Component IV in the summer of 1998.

Changes in Pedagogy

- The curriculum was divided into four components, each representing a year.
- Component I, Biomedical Fundamentals, serves as a firm foundation for the educational program, followed by more complex basic science information presented in a clinically relevant, organ-based and disease-based context in Component II.
- Component III consists of redesigned core clerkships, including an eight-week ambulatory primary care clerkship, emphasizing basic medical principles, primary care, and preventive medicine.
- Component IV provides additional responsibilities for patient care, an eight-week block of critical care medicine, and 24 weeks of electives.
- This experience also provides for a four-week subinternship and at least four weeks of an applied, in-depth basic science elective.
- All courses in Components I and II are interdisciplinary and are supported by the Office of Medical Education.
- The number of lecture hours was significantly reduced and small-group, case-based exercises were introduced into most clerkships and courses.
- Informatics competencies were infused throughout the curriculum and computer-based exercises and testing were made an important part of most courses.

Changes in Assessment

- Students are assessed in the cognitive, affective, and psychomotor domains in all courses, with an emphasis on formative evaluation throughout the courses, providing frequent feedback to the student.
- A pass/fail/honors grading system is used, with emphasis on written narrative evaluation.
- The students are assessed individually against the curriculum standards and are not ranked among their peers.
- USMLE Step 1 must be passed before formal promotion to Component III and taking USMLE Step 2 is required in Component IV.
- The student must take a comprehensive basic science examination and must pass a Comprehensive Clinical Competency Examination in the fall of the fourth year.
- Students are given the opportunity and encouraged to evaluate each of their educational experiences.

Clinical Experiences

- Clinical experience is a prominent part of the curriculum in all components, beginning with physical diagnosis instruction in the first week of the first year and a Longitudinal Primary Care Clinic in the second year.
- Ethical, societal, behavioral science, and preventive medicine issues are integrated into all four components.

Curriculum Review Process

- The following are used in the curriculum review process.
  - Student evaluations of all courses, with focus groups used to get feedback
  - Faculty evaluations of courses and components
  - Assessment of student preparedness for the core clerkships as a measure of curriculum review
  - Assessment of mastery of objectives by in-house ex-

  aminations, National Board subject examinations, OSCEs, and written and oral presentations
  - Assessment of clinical competencies in all components
  - Evaluation of responses to AAMC Graduation Questionnaires
  - Assessment of graduates' performances during first postgraduate year by program directors
  - Assessment of graduates' residency match results, specialty choices, and locations
- The resources and strategies necessary for curriculum renewal included
  - strong support from the Dean
  - a close working relationship among the medical education office, chairs, and core teaching faculty
  - a change in budgetary allocation to include a centralized educational budget for the Office of Medical Education
  - commitment by the university and the medical school to upgrade information technology and make access available for all students and faculty
  - development of a clinical assessment center and standardized patient program under the direction of a doctoral-level nurse and an educational specialist
  - recruitment of strong, committed faculty as component directors
  - appointment of skilled (master's-degree) curriculum coordinators for Components I and II
  - responsiveness to faculty suggestions and concerns and willingness to make mid-course corrections
  - reorganization of the Office of Academic Affairs with separation of educational affairs from faculty affairs and appointment of a dedicated associate dean for medical education
  - development of an academic enrichment center for students at academic risk
- Preliminary results of the curriculum review show that
  - all components have been introduced remarkably smoothly.
  - internal assessment measures showed general mastery of objectives.
  - cognitive measures showed no significant differences from the traditional curriculum. There has been a consistency in evaluation from course to course.
  - scores on the NBME subject examinations in Microbiology, Pharmacology, and Pathology show slight improvement from the traditional curriculum.
  - the first classes of the new curriculum (classes of 2000 and 2001) have taken USMLE Step 1, and the class average has been at the national mean (similar to other recent Creighton classes).
  - students' written comments are enthusiastic; however, there has been no significant overall change in computerized ratings.
  - students love the small-group sessions.
  - students thrive on the clinically relevant content in basic science courses.
  - students made many suggestions regarding the individual courses and schedules, many of which have been implemented.
  - the students appreciate feedback from the standardized patients.
- The lessons learned from the curricular renewal process include
  - the standardized patient program has been extremely valuable—feedback well received.
  - faculty intimately involved with the new curriculum are very supportive.
  - there has been high student satisfaction with small groups.
  - students are surprisingly adept at finding information using the computer and the Internet.
  - the fewer lecturers in a course the better, but other faculty need to be involved in small groups or other activities.
  - students are very adaptable, enthusiastic, and accepting of change if involved, fully informed, and given the opportunity (through formal evaluations and feedback sessions) to provide input.
- The challenges of the process include
  - getting faculty (especially clinicians) to think outside their disciplinary "boxes" and to take a more global view of the educational process.
  - quantifying subjective evaluation feedback.
  - continued case development—both for preclinical courses and for OSCEs and CBX examinations.
  - recruitment of clinical sites for longitudinal students and ambulatory clerkships (enough to rotate sites and give certain sites/practitioners a breather).
  - involving basic scientists and incorporating basic science into the clinical clerkships.
  - integration of clinical disciplines, i.e., women's health: should there be an ob–gyn core clerkship—or should it be women's health in the broad sense—or even further, should the ob–gyn and pediatrics clerkships be integrated into a maternal–child clerkship.
  - more effective evaluation of student performances in small-group activities.
  - stimulation of faculty involvement as small-group facilitators.
  - convincing faculty and chairs that teaching really does count toward promotion and tenure.
  - better integration of ethical, societal, and behavioral issues into all levels of the curriculum—students and faculty often perceive these topics as "soft."

Future Goals

- A mission-based management initiative—highlighting the educational mission and assuring resources for the mission.
- Promotion of increased integration among the primary care disciplines.
- Transformation of the Office of Medical Education into a "Center for Medical Education," enhancing faculty development, student evaluation, and initiating a major educational research program made possible by a substantial Health Futures Foundation grant.
- Reinstituting a postbaccalaureate program for educationally/environmentally, and economically disadvantaged students.
- Renovation of basic science teaching areas to better meet the demands of the new curriculum.

University of Nebraska College of Medicine

GERALD MOORE, MD

Curriculum Management and Governance Structure (See Figure 1)

- The Curriculum Committee is responsible for the overall management of the curriculum.
- Year committees composed of core/clerkship directors each supervise one entire year.
- Core/clerkship directors are responsible for day-to-day coordination.

Office of Education

- The Educational Support Office was created in 1991 to support the curriculum.
- The office is responsible for support of the interdisciplinary curriculum.
- The office is responsible for record keeping, evaluation, grading, and the problem-based-learning components of the curriculum.

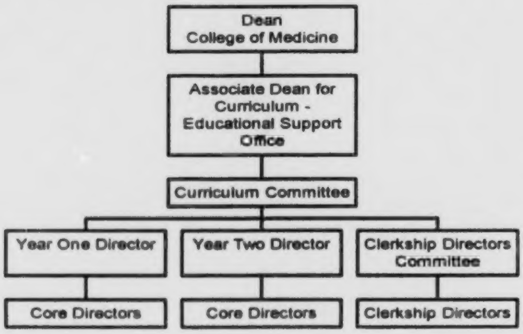
Budget to Support Educational Programs

- The Educational Support Office receives funding directly from the dean.
- Individual faculty may apply for annual educational development grants.
- Information technology assistance is supported through central administration of the university.

Valuing Teaching

- Core/clerkship directors are recognized annually in the educational newsletter.
- Educational development grants are awarded annually on a competitive basis, with preference given to those faculty with primary educational responsibilities.
- The annual faculty honors convocation recognizes faculty receiving special awards.

FIGURE 1: Curriculum Management and Governance Structure



CURRICULUM RENEWAL PROCESS

- Goals of the curriculum:
  - Increase the number of primary care physicians for the State of Nebraska
  - Continue to develop competency in biomedical science
  - Encourage a balance between the acquisition of knowledge and the development of attitudes and skills of students
  - Cultivate a learning atmosphere that encourages enthusiasm, altruism, idealism, and professional behavior
  - Develop an appropriate balance between didactic and self-directed learning
  - Encourage a teaching approach that fosters lifelong learning skills and promotes intellectual curiosity
  - Improve integration of subject materials and basic science/clinical correlations
  - Provide earlier exposure to patient care

Learning Outcomes

- The curriculum committee annually reviews the goals and outcomes for graduation.
- Both student and program objectives have been developed. The objectives are available upon request.
- Student objectives
  - Knowledge—the student must acquire, understand,

and apply the biomedical science knowledge that is essential for the identification, evaluation, and treatment of disease and for the promotion of health. The student will demonstrate an understanding of the personal, cultural, occupational, and societal factors that affect the health and well-being of the patient.

  - Attitudes—the student must demonstrate professional competence and respect for patients' value systems when dealing with patients and family members. The student will be ethical and respectful when interacting with faculty, classmates, and other health care professionals.
  - Skills—the student must demonstrate the requisite history and physical examination skills and problem-solving ability to allow her or him to appropriately evaluate the patient. The student must also demonstrate the ability to be a self-directed, lifelong learner, make appropriate assessments of patient problems, and develop appropriate therapeutic plans of action.
- Program objectives—The curriculum will allow students to
  - attain clinical competency (the ability to conduct a history and physical examination, formulate differential diagnoses, use laboratory and radiographic studies, formulate treatment plans), as tested by the senior objective structured clinical examination.
  - acquire knowledge in the basic sciences, as evidenced by a composite pass rate on the United States Medical Licensure Examination (USMLE) at or above the national average.
  - develop an appreciation of the need for primary care physicians in the State of Nebraska, which will encourage students to pursue primary care careers.
  - develop the skills needed to identify appropriate patient diagnosis and management and for professional conduct and independent learning, which will be documented by ratings of the college's educational programs at or above the national average in the responses to the AAMC Graduation Questionnaire.
  - match to a residency in graduate medical education—one of the student's top three choices in the National Resident Matching Program (NRMP).

Changes in Pedagogy

- The curriculum uses lectures, laboratory, small-group sessions, problem-based learning, and private office-based experiences.
- Students work with one problem-based learning case every two weeks.
- There is extensive use of standardized patients in the first two years for students to learn patient interviewing and communication skills.

Application of Computer Technology

- Students are strongly encouraged to have computers.
- Computer clusters are available for students in the library and across campus.
- Most core courses and clerkships have Web pages with pertinent information posted.
- Individual faculty members have developed Web-based pages for lectures.
- Streaming video is used to transmit conferences across the state.

Changes in Assessment

- Multiple-choice examinations remain the evaluation instrument of choice.
- OSCEs are used in all four years.
- The OSCE is used to assess history and physical examination skills in the first two years.
- Several of the required clerkships use clerkship-specific OSCEs.
- A fourth-year OSCE must be passed for graduation.
- Standardized patients are used for training of students as well as evaluation.
- Feedback is provided by the standardized patients for first- and second-year students.
- Isolated locally developed computerized evaluation programs are in use.

Clinical Experiences

- Students have a longitudinal clinic experience that consists of one-half day per month for the first two years.
- The primary care block experience provides students the opportunity to spend three weeks in a rural physician's office between their first and second years.
- During the third and fourth years students participate in standard inpatient and outpatient clinical experiences.
- Students have the opportunity for rural-based rotations in many required clerkships.

Curriculum Review Process

- Curriculum renewal occurred in 1992.
- The curriculum changed from a departmental to an interdisciplinary format.
- The school increased the numbers of small-group and problem-based learning lessons and emphasized independent learning.
- A formal review of core/clerkships occurs on an annual basis.
- Each core course and clerkship is reviewed annually by the "year" committee and the curriculum committee.

Future Goals and Challenges

- The school is currently beginning discussions about the curriculum of the future. The questions under consideration include:
    - What will be the role of multimedia?
    - Who will be teaching the students?
    - Is a vertical curriculum more comprehensive and effective?
    - What will be the status of the academic medical center in the future?

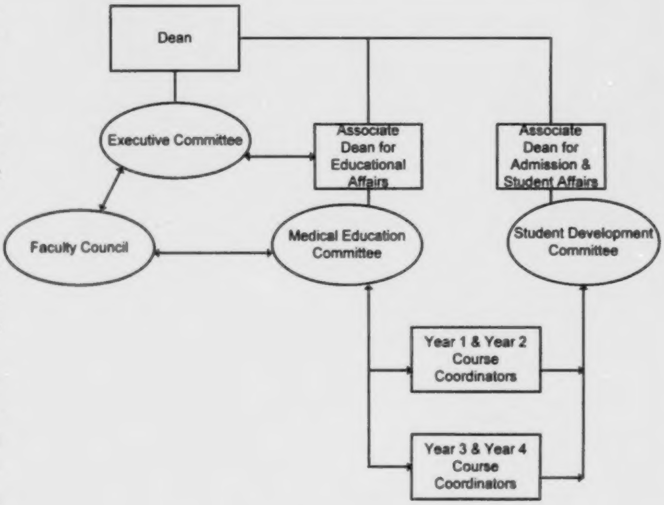
University of Nevada School of Medicine

TRACY L. VEACH, EDD

Curriculum Management and Governance Structure

- Administrative governance is through the dean, Executive Committee (chairs), and dean's staff, primarily the associate dean for educational affairs.
- Faculty participation is through the Medical Education Committee, which is composed of elected representatives, the chairs of its two subcommittees, and the associate dean, plus the Office of Medical Education staff as ex-officio members.
- The two subcommittees are:
  - Year one and two course coordinators. This committee is composed of all course coordinators from years one and two, with the chair appointed from nominations by faculty.
    - The committee has the dual role of making recommendations about student progress to the Student Development Committee via the associate dean for student affairs and making curricular management recommendations to the associate dean for educational affairs and the medical education committee.
    - The subcommittee has four student representatives (two first-year and two second-year students) who are appointed by the associate deans from a nomination slate provided by each class.
  - Years three and four course coordinators. This committee is composed of all course coordinators from years three and four (which includes departmental courses and electives as well as interdisciplinary courses).
    - The subcommittee has a dual function for the last two years of medical education. Student representatives serve on this committee. This group also makes its recommendations to the associate dean and the Medical Education Committee.
- The major change since 1990 has been the creation of the Medical Education Committee. Prior to 1996, this committee was called the Curriculum Committee. It consisted of appointed faculty from each department and program involved in teaching, as well as student representatives from each medical school class. In addition, the subcommittee focused most of its time on student progress. The faculty felt that the Curriculum Committee was not highly functional, and changes were implemented to reconstitute governance into the current systems.

FIGURE 1: Education Committee and Governance Structure


Dean
Executive Committee
Associate Dean for Educational Affairs
Associate Dean for Admission & Student Affairs
Faculty Council
Medical Education Committee
Student Development Committee
Year 1 & Year 2 Course Coordinators
Year 3 & Year 4 Course Coordinators

- Curricular management is now a more fundamental part of the Medical Education Committee's work. See Figure 1.
- Discussions are under way to make further changes in governance because the subcommittees have been highly effective in educational management while the Medical Education Committee has been less so.
- The arrival of a new dean will initiate a strategic planning process that will result in changes to the educational governance.

Office of Education

- Throughout the history of the school, there has been an administrative unit to support educational programs.
- Prior to 1990, it was called Office of Educational Support Services, Office of Evaluation and Educational Research, Office of Educational Services.

- In 1991, the Office of Medical Education was organized and an associate dean was recruited to administer this unit.
- In 1994, the office began undergoing reorganization with a new associate dean. The office has expanded responsibilities to include a new curriculum, restructuring of the office, and inclusion of the medical library and instructional facilities under the associate dean.

Budget to Support Educational Programs

- A portion of the educational budget is direct state money, used primarily for staff salaries and the salaries of community-based faculty.
- Other funding comes from grants, gifts, and the dean's discretionary funds.
- The associate dean prepares a programmatic budget for the dean.
- Funding is stable for core programs but not for interdisciplinary or informatics programs.

Valuing Teaching

- There is recognition for teaching and educational management services via annual evaluations for promotion and merit.
- Teaching awards are given, including Teacher of the Year award, which has a monetary component.
- The school is starting a faculty scholars group to identify and recognize faculty who contribute to the educational programs and to provide faculty development for faculty who want to improve their educational contributions.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- There are only very general outcome objectives to which faculty have agreed.
- The Medical Education Committee and its subcommittees are charged with reviewing and recommending specific attributes that students should demonstrate prior to graduation.
- The committees are using the AAMC's Medical School Objectives Projects (MSOP) reports as a basis for their deliberations.
- The committees are also using experiences with an end-of-third-year clinical examination, including OSCE procedures to augment this process.
- No working draft or final report is yet available.

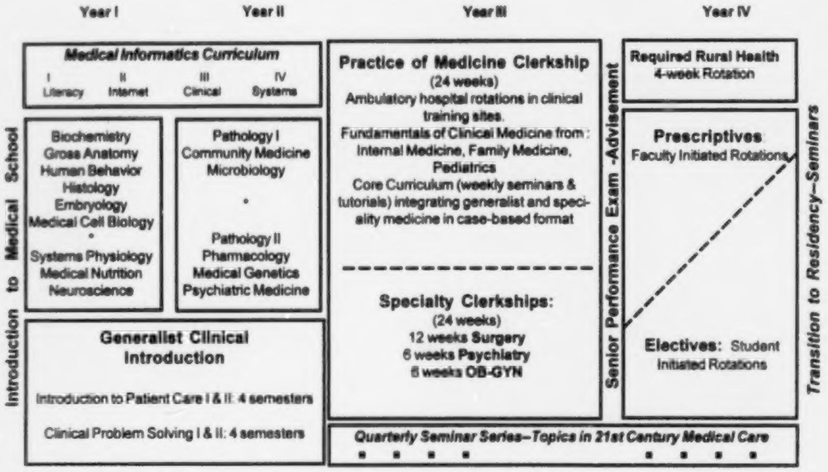
Changes in Pedagogy

- Prior to 1994, the curriculum was quite traditional, with basic science courses in the first two years followed by traditional clerkships in the third and fourth years.
- There was an Introduction to Clinical Medicine course with community precepting and a fourth-year rural rotation, but only isolated case-based and small-group learning embedded in some courses.
- With support from a "generalist grant" from The Robert Wood Johnson Foundation, the school reviewed and revised the curriculum specifically to add
    - a four-semester Introduction to Patient Care course (including two semesters of ambulatory precepted experience, one half-day a week)
    - a four-semester Clinical Problem Solving course focused on integration of basic, behavioral, and clinical sciences in small-group sessions
    - a 24-week ambulatory/hospital clerkship—Practice of Medicine—that integrates and replaces previous rotations of internal medicine, family medicine, and pediatrics. This rotation also includes a weekly core curriculum, using distance education technologies for all students in the rotation throughout the state. The format is case-based, facilitated by generalist and specialist physicians and other health professionals.
    - an elective course, Teaching and Learning in Medicine, in which fourth-year medical students are primary teachers in the Introduction to Patient Care course.
    - See Figure 2 for a chart of the curriculum.
- Standardized patients are used in the Introduction to Patient Care course for teaching and evaluating interviewing and physical examination skills.
- Standardized patients are used in selected clerkships as well as the Senior Performance Exam that is conducted just prior to the start of the fourth year.

Application of Computer Technology

- Students are required to have computers. This was initiated with the entering class in 1999.
- The associate dean for educational affairs has overall responsibility for computer technology. The Office of Med-

FIGURE 2: Medical Education Curriculum, 1999–2000


Year I
Year II
Year III
Year IV
Medical Informatics Curriculum
I Literacy
II Internet
III Clinical
IV Systems
Introduction to Medical School
Biochemistry
Gross Anatomy
Human Behavior
Histology
Embryology
Medical Cell Biology
Systems Physiology
Medical Nutrition
Neuroscience
Pathology I
Community Medicine
Microbiology
Pathology II
Pharmacology
Medical Genetics
Psychiatric Medicine
Generalist Clinical Introduction
Introduction to Patient Care I & II: 4 semesters
Clinical Problem Solving I & II: 4 semesters
Practice of Medicine Clerkship
(24 weeks)
Ambulatory hospital rotations in clinical training sites.
Fundamentals of Clinical Medicine from: Internal Medicine, Family Medicine, Pediatrics
Core Curriculum (weekly seminars & tutorials) integrating generalist and speciality medicine in case-based format
Specialty Clerkships:
(24 weeks)
12 weeks Surgery
6 weeks Psychiatry
6 weeks OB-GYN
Senior Performance Exam -Advisement
Required Rural Health
4-week Rotation
Prescriptives: Faculty Initiated Rotations
Electives: Student Initiated Rotations
Transition to Residency—Seminars
Quarterly Seminar Series—Topics in 21st Century Medical Care

Note: Italics indicate programs in development

ical Education coordinates all computer-based educational innovations for both centrally initiated and department-based programs.

- There are instructional facilities in the medical library in Reno and the Ambulatory Center in Las Vegas.
- The Office of Medical Education also supports a small student computer lab in the Student Affairs area of the academic building in Las Vegas.
- The office recently (1999) created a Division of Medical Informatics and Information Technologies.
- Funding for the new division provided for 1.5 FTE technical staff to provide support services for educational computing.

Changes in Assessment

- Standardized patients are used in the Senior Performance Exam at the end of the third year as a fundamental part of student assessment. The examination has been required for the last two years.
- The results of the Senior Performance Exam are reviewed and recommendations made to faculty advisers, who meet with each student to review performance and conduct educational planning.
- The school is a member of the Northwest Consortium and recently joined the California Consortium to develop and use common standardized-patient formats for assessment. The school will use comparative data from the other medical schools in the consortia in program evaluation.
- A case-based computer assessment was added to the Senior Performance Exam in June 2000.
- Course coordinators are adding computer-based testing as part of the ongoing curriculum improvement process.
- Faculty observations are part of the program throughout the three years of the curriculum. Formal assessments of clinical skills are conducted regularly.
- All courses require standardized ratings by faculty. Since the class size is small, direct observation is part of most clinical ratings.
- The OSCE is used for both teaching and evaluation.
- The OSCE has been a relatively low-stakes pilot during the last two years, used for outcome evaluations, curricular evaluation, and student performance assessment in the Senior Performance Exam.
- It was anticipated that the examination in 2000 would be "higher stakes," involving more advising and educational counseling issues.

Clinical Experiences

- Students have ambulatory experiences as part of the Introduction to Patient Care course. These include limited hospital and clinic experiences.
- In the Practice of Medicine clerkship, students spend

about half of their time in ambulatory settings and half in hospital-based settings.

- Ambulatory experiences occur in both School of Medicine clinics and private physicians' offices. In these latter sites, students provide hospital care as part of the physicians' practices.
- Clinical logs are used to monitor and adjust students' educational experiences.
- The students run an outreach clinic to provide services to underserved populations that also serves as an educational venue for first-, second-, and third-year medical students and other health professionals in training.

Curriculum Review Process

- A major review was done as part of the "generalist initiative" in 1993–94.
- Since the implementation of the generalist program, review has been continuous and numerous adjustments have been made to the curriculum.
- A major review of the first two years was initiated in 1997–99.
- School-wide retreats as well as ongoing curricular meetings of course coordinators were used to look at the current structure and process.
- Small review groups examined each course and reported on specific modifications to improve the course. The groups were interdisciplinary and included student representatives.
- There was a concern that the curriculum was "overly stuffed," i.e., had too many tests, too many scheduled class hours, etc.
- The Office of Medical Education provided support to faculty and departments in this review process.
- Implementation plans were recommended and are being implemented in 1999–00 and the next academic year.
- The changes include a 10–15% reduction in scheduled hours, new levels of integration in basic sciences (neuroscience and molecular biology and genetics), and integration of clinical problem solving cases with basic science teaching in traditional courses.
- Additional resources are provided in a new position of Director of Evaluation, which was filled as of July 1999. This person is developing an overall evaluation plan with the educational governance committees.
- The Medical Education and Clinical Coordinators are reviewing the educational program. The committees are considering the content and structure as well as the governance of the curriculum. This is an evolving and continuous review process.
- Discussions with the new dean regarding a strategic planning process for all core missions of the school, including the educational enterprise, are under way.
- It is likely that the school will engage in a continuous educational quality improvement strategy rather than a revolutionary change.

Future Goals

- One critical element in the process is likely to be mission-based budgeting and a review of educational funding allocations.
- Another issue will be instructional technologies, for a new medical education building scheduled for completion June, 2001.

Dartmouth Medical School

David W. Nierenberg, MD, Patricia Carney, PhD, and Joseph F. O'Donnell, MD

Curriculum Management and Governance Structure

- The Medical Education Committee began in 1994.
- The approach focused on innovation in medical education, which advanced the activities of the previous curriculum committee.
- The members are nine faculty-at-large, educational administrative leaders, and students.
- The dean appoints the members for three-year terms.
- There is no "representation" of courses or departments on the committee.
- The position of associate dean for medical education was created in 1995.
- Working groups responsible for planning and coordination of each of the four years of the educational program were identified.
- The separate Committee on Evaluation of the Curriculum, Faculty, and Students was created.

Office of Education

- The office was established in 1995 (under the new associate dean for medical education).
- The office is responsible for overall management of the curriculum and support of educational activities.
- The office is responsible for supporting systems for student evaluation (of courses, clerkships, and teaching), and alumni that supply information to improve faculty and program performances.
- The office provides faculty development activities and develops innovative student assessment tools (OSCEs) for courses in all four years.
- In addition, the office supports research and academic scholarship in medical education, supports the Office of Clinical Education, and supports the coordinators for year one and year two.
- The office provides financial support to non-departmental courses in all four years.

Budget to Support Educational Programs

- There is budget support for the Office of Medical Education, its personnel, and activities.
- Individual departments do not offer support for all courses.
- Development funds are available for planning new courses or clerkships.
- There is an evolving program to support community clinicians who help with all types of teaching over all four years.
- A defined budget and authority are given to the associate dean for medical education for the educational program.

Valuing Teaching

- All faculty at the medical center are expected to teach medical students.
- Faculty with substantial teaching responsibilities (e.g., course directors, clerkship directors, PBL tutors, etc.) usually receive direct salary support for teaching.
- The Office of Community Education and Research focuses on enhancing community-based education for faculty and students.

CURRICULUM RENEWAL PROCESS

- A large-scale curriculum improvement was launched in 1991; most major changes were in place by 1997.
- Key to the success of the process have been the buy-in by faculty and students and moral and financial support from the dean.

Learning Outcomes

- The Vertical Integration Groups study important themes (e.g., medical ethics, geriatrics, new skills for managing patient care).
- Learning objectives in each area are developed by a multidisciplinary team.
- New information, knowledge, and skill materials are incorporated into existing courses and clerkships.

Changes in Pedagogy

- The changes have been evolutionary rather than revolutionary.
- There is a greater emphasis on independent, active learning.
- There is increased emphasis on employing a variety of learning methods.
- There is an emphasis on the integration of clinical and basic science materials.
- Problem-based learning has been incorporated in many courses.
- There are closer mentoring relationships of faculty with students.
- There is earlier exposure to patients and clinical learning.
- There is less formal, scheduled classroom time (down to 25 hours per week, including the new On Doctoring course).
- There are continued efforts to empower students through community service, committee work, and student-generated electives.
- The humanities have been incorporated into electives and formal coursework.
- There are integrated interdisciplinary clerkships in the third year.
- There are required fourth-year courses on clinical pharmacology; health, society, and the physician; and advanced medical sciences (which addresses what is new in the sciences since the students took them in years one and two).

Application of Computer Technology

- The school has begun implementing the recommendations of a "vertical integration group" report concerning weaving computer skills and informatics into the curriculum.
- Students are required to learn various computer skills sequentially over the four years.
- The use of computers is taught in the context of their use during existing courses or clerkships. For example: formal Medline searches are required in the year-two problem-based-learning course.
- Students are required to use e-mail every day.

Changes in Assessment

- Increasingly diverse methods are used to assess student performances, mastery of facts, skills, and attitudes.
- Written exams are common in courses and clerkships.
- OSCE exercises are used extensively in years one, two, and three.
- Papers and computer assignments are common in courses and clerkships.
- Oral presentations and participation in conference groups are used increasingly to assess students' presentation skills.

Clinical Experiences

- A new clerkship in women's health has been developed.
- There is a new requirement to complete a subinternship during the fourth year.
- The third-year clerkships have been integrated and coordinated into three 16-week blocks (with attempts at integration between disciplines during the block).
- Medicine and psychiatry are now coordinated into one 16-week block (common themes being death and dying, HIV, substance abuse, chronic pain, etc.).
- Three primary care clerkships are now coordinated into one 16-week block.
- Surgery, ob–gyn, and inpatient pediatrics are now coordinated into one 16-week block.
- New OSCE exercises have been developed to assess student competencies in a variety of clinical skills.

Curriculum Review Process

- There has been strong encouragement from the dean to proceed with curriculum review.
- There is overall coordination by the Medical Education Committee.
- The design work is done by a number of committees (e.g. planning changes to year two, year three, year four, evaluation, etc.).
- Faculty, administrators, and a large number of students have participated in the process.
- The curriculum has been approved at key steps by the general faculty.
- The appointment of the new associate dean for medical education (with dedicated time) has been instrumental in helping move the process forward.
- The medical education committee has taken a continuous-quality-improvement approach to the review of the curriculum.
- There are frequent reviews of key courses and clerkships.
- There is an intensive program of student evaluation of courses and clerkships.

- The evaluation group monitors more than 20 separate educational outcomes (a "matrix" of outcome measures).
- A survey has been developed and refined and is sent to graduates who have been away from the school for seven years, to learn what they are doing and how well their medical school experiences have served them.
- Graduates are surveyed during their internships.
- Internship program directors are surveyed about the graduates.
- The AAMC Graduation Questionnaire is used to track changes in student feedback from year to year.

UMDNJ–New Jersey Medical School

ELIZABETH A. ALGER, MD

Curriculum Management and Governance Structure

- Governance of the educational program is the responsibility of the faculty.
- The Committee on Academic Programs and Policies, a standing committee of the Faculty Council, is charged with "recommending and reviewing programs of medical education, including recommending policies for evaluation of teaching performance . . . and making recommendations to the dean and to the council regarding implementation of these programs."
- The dean is the chief academic officer of the medical school. Management of the educational programs is a shared responsibility of the academic departments and the Office of Educational Affairs reporting to the dean.
- The Committee on Academic Programs and Policies (AP2) is a surrogate for the faculty at large.
- Membership on the committee is not representative. The advantage is that the committee is apolitical, and its recommendations are made from an institutional perspective. The disadvantage is that it does not provide a forum for the interdepartmental negotiations that are the business of many curriculum committees.
- Until the early 1990s, the Office of Education provided mainly service functions and was not accorded a role in curricular planning. Thus, departmental prerogative prevailed, change occurred only by consensus, and it was often modest.
- The first major curricular revision in 17 years occurred in 1989–1991. In addition to programmatic changes, it resulted in significant changes in governance.
- Preclinical and clinical curriculum subcommittees, consisting of course and clerkship coordinators, respectively, were created.
- The subcommittees are responsible to the parent Committee on Academic Programs and Policies. AP2 selects the subcommittee chairs, which in turn serve as ex officio members of AP2, with the right to vote.
- The role of the subcommittees expanded considerably during the last decade. Subcommittees are responsible for horizontal and vertical integration of the curriculum, and are achieving this goal with progressively greater degrees of success.
- The subcommittees have also adopted formal processes for peer review of courses; these peer reviews continue to become more discriminating and to have greater impact.
- The past decade has seen significant changes in governance and management of the educational programs at the New Jersey Medical School (NJMS). The governance structure now provides effective mechanisms for decision making, implementation, and accountability.
- Management of the curriculum is also becoming progressively more centralized. These changes have occurred by evolution and consensus. In the process, collegial relationships have been strengthened and a sense of collective responsibility for the educational mission of the school has been reinforced.

Office of Education

- The Office of Education was established in the late 1970s.
- The scope and influence of the Office of Education have expanded during the past decade.
- The office has taken on the responsibility for offering or coordinating several interdisciplinary courses.
- Course, clerkship, and faculty evaluations are now conducted by the Office of Education; these evaluations will be Web-based by the end of the year 2000 in response to departmental requests for more frequent and timely information.
- The Office has also become responsible for promoting compliance with AP2 and Faculty Council policies, and for coordinating curriculum time among departments.
- With the curricular change, the Office of Education has assumed a greater role in course scheduling.
- The Office is also playing a role in administering interdisciplinary programs. The first-year problem-based learning (PBL) course was organized under the Office of Education. The Office has recently hired a coordinator of ambulatory-care and clinical-skills teaching who serves as coordinator of the second-year Introduction to Clinical Sciences course. The standardized-patient program that supports clinical skills teaching and testing is also organized under the Office of Education.
- The staff of the Office of Education has been augmented to help meet these new responsibilities.

- An Office of Educational Research and Evaluation has been established.
- Positions for director of the standardized-patient program, coordinator of ambulatory-care and clinical-skills teaching, and teaching specialist in the computer learning lab have been established.
- The Office of Academic Development, staffed by two full-time professionals, has been established to support student learning needs and assist students who are in academic difficulty.
- The Office of Education is also responsible for education facilities.
- The past decade has seen the creation of 14 PBL rooms, renovation of laboratories and lecture halls with upgraded multimedia capabilities, establishment of a computer learning lab, and deployment of an inter-hospital videoconferencing network.
- A dedicated clinical-skills teaching and testing facility, organized under the Office of Education, is in the final design stages. Two new positions have been created to support these services.

Budget to Support Educational Programs

- A discrete budget to support the educational program has been in effect since the late 1970s.
- The operating budget of the Office of Education is derived from the state appropriation to the university. Supplemental funding comes from grants received by the Office (direct and indirect costs), state bonds issued for technology and capital improvements, and charge-backs to other units of the university (A-V services).
- New programs and program improvements have also been supported by the dean from clinical revenues.

Valuing Teaching

- The NJMS bylaws include a clinical educator track for physicians teaching in the clinical years.
- Several changes in the past few years have added stature to this track. Multi-year contracts have replaced the previously ubiquitous single-year contracts. This has lent greater stability to the cadre of teaching physicians, especially those who serve as clerkship coordinators.
- The term "clinical" has been deleted from the academic titles of the clinical educators, giving them nominal parity with their tenured and tenure-track peers.
- Course and clerkship coordinators are selected by department chairs subject to the approval of the senior associate dean for education. Their participation in the curriculum subcommittees gives them a recognized voice in curricular planning and evaluation. They frequently receive information items from the Office of Education, are invited to meet with visiting consultants, are given priority in attending faculty development workshops, and may receive partial support for travel to attend regional and national meetings.
- Their administrative contributions are taken into consideration by their department chairs in annual faculty evaluations.
- An effort to institute "educators' portfolios" has been less successful.
- Although the faculty committee on promotions and tenure has agreed in principle to consider portfolios in its decisions, no one has yet come before the committee with complete documentation.
- The NJMS has several ways of recognizing outstanding contributions by individual faculty members.
- Golden Apples are awarded annually to two or three faculty members by each of the four medical school classes; the dinner dance at which this occurs is the highlight of the year.
- Nomination statements for all nominees are posted on the student bulletin board and Web site and are published in the student newspaper.
- The medical school gives two teaching awards annually at its convocation, and the university has a teaching excellence award.
- The university is also initiating a Master Educator program in which each school will select two faculty members a year to serve five-year terms as members of a Master Educator Guild. The designation will carry a monetary award for further professional development, a lapel pin, and a medal to be worn on ceremonial occasions.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The faculty agreed upon learning outcomes that students must demonstrate prior to graduation (A copy of the objectives is available from the author.)
- Prior to beginning the recent curriculum revision (1998), several modified Delphi-type retreats were held to identify the desired learning environment, e.g., "the core values that should serve to attract students to NJMS" as

well as "the qualities and attributes that all graduates of NJMS should demonstrate."

- The AAMC's *Learning Objectives for Medical Student Education* was distributed to all participants. However, the group on Qualities and Attributes was asked to work independently. After the working groups presented their reports, all participants were asked to rank the items in order of priority.
- The AAMC's Medical School Objectives Project (MSOP) objectives, as modified by the 70-plus participants in the retreat, were adopted by the faculty council as the template for curricular revision. The item that received highest priority was clinical competency.
- In a subsequent retreat, specific objectives for clinical skills acquisition in each of the four years were developed; these are now being systematically implemented.
- Allowing for some differences in language, the "Qualities and Attributes" report closely mirrored the corresponding information from the MSOP. There were, however, specific additions to each of the objectives:

Altruism

- Able to practice culturally competent medicine, i.e., to be aware of, able to elicit, and able to work with a patient's personal beliefs and values
- Socially aware and committed to the welfare of underserved communities

Knowledge

- Able to integrate basic science and clinical knowledge
- Knowledge of functional capacities (physical and mental) of patients, ways of evaluating them, and ways of maintaining/restoring optimal function

Skill

- Able to educate patients about their conditions in language understandable to them and in culturally appropriate context
- Able to demonstrate a variety of leadership skills and to assume an appropriate leadership role as determined by the task at hand

Duty

- Able to adapt to diverse geographic, social, and cultural environments
- Able to advance scientific knowledge by participating in original or applied research

Changes in Pedagogy

- Weekly PBL sessions (six to seven students) were introduced into the first-year curriculum in 1991–92.
- Workshops, problem-solving sessions, recitations, small-group conferences, and clinical skills preceptorships have been either introduced or increased in all preclinical courses.
- In 1990–91, lectures comprised 57% of all teaching activities; by 1999–2000 they comprised less than 47%.
- Case-based conferences in basic science courses introduce and reinforce biomedical concepts.
- PBL sessions in the first year introduce ethical, economic, legal, psychosocial, and cultural concepts.
- Case discussions in the second-year Introduction to Clinical Sciences course introduce principles of differential diagnosis and reinforce concepts in clinical epidemiology.
- The medicine clerkship has replaced lectures with case-based conferences focusing on differential diagnosis and principles of clinical management.
- The family medicine clerkship also uses PBL sessions to reinforce concepts of preventive and interdisciplinary care.
- Standardized patients (SPs) are used beginning in the first year to teach history taking and communication skills. They are also used for teaching certain portions of the normal physical examination.
- In the second year, SPs teach advanced history taking, gynecologic teaching associates (GTAs) teach the female breast and pelvic examination, and urologic teaching associates (UTAs) teach the male rectal and genital examination.
- Actual patients are also used to teach advanced communication skills and focused history and physical examination of prototypic diseases of the organ systems.
- The Office of Education received a grant from the Foundation of UMDNJ in 1995 to create a standardized patient program. There are now over 40 active SPs in the program. The program was institutionalized in 1998.
- New positions for a director and assistant director of the SP program have been approved, and dedicated space of approximately 10,000 square feet has been committed for a clinical skills teaching and testing facility.

Application of Computer Technology

- Students are not required to own computers, but over 80% do.
- Three computer labs and computers in open PBL rooms satisfy on-campus needs.
- Pilot projects with wireless access in public areas are in progress.

- Introductory workshops in e-mail, Web access, and literature searching are offered during the first-year orientation.
- The first-year biostatistics and epidemiology courses require weekly computer-based exercises.
- Students in PBL sessions and critical-appraisal workshops make extensive use of electronic resources.
- A number of the preclinical courses feature communication with students via e-mail, including the transmission of grades and feedback on examination questions.
- Several departments provide syllabi and course materials (e.g., annotated pathology slides) via an intranet.
- An evidence-based medicine exercise in the second year requires a computer-based literature search.
- An active student Web site provides links to instructional materials developed elsewhere.
- Clinical departments are beginning to make use of computer-based case simulations, e.g., for instruction in diagnostic reasoning.
- The emergency medicine clerkship requires the completion of several computer-based cases.
- CD-based clinical cases and tutorials in radiology and ECG interpretation have been made available by the Office of Education in student and resident lounges at all primary teaching hospitals.
- Computers for student use have also been provided to primary teaching hospitals as needed.

Changes in Assessment

- An OSCE using standardized patients is given at the end of the first and second years.
- OSCEs are also used as clinical skills assessments at the end of the clerkships in medicine, pediatrics, family medicine, and obstetrics and gynecology.
- A pilot OSCE is being introduced for the psychiatry clerkship this year.
- Plans are under way for a high-stakes, comprehensive OSCE to be given during the fourth year.
- The NJMS is participating in the National Board of Medical Examiners' Standardized Patient Consortium and anticipates becoming a testing center for the USMLE Step 2b examination.
- The school has not yet instituted computer-based case simulations as a method of assessment. The main limitation has been lack of computer resources.
- An enlarged student computer lab, suitable for computer-based teaching, is included in plans for expansion of teaching facilities.
- The number of observed history and physical examinations in the second-year Introduction to Clinical Sciences (ICS) course has been increased significantly in the past two years.
- Students now perform focused histories and physicals (H & Ps) under direct faculty supervision on three patients a week for ten to 11 weeks and then perform four complete H & Ps in preceptors' offices, one of which is fully observed and the others reviewed for abnormal findings.
- The final examination in ICS includes a focused history and complete physical examination conducted and evaluated by a trained SP.
- A standard rating form for the evaluation of student performance in clerkships was adopted in 1994–95. It includes items requiring observation of history taking, communication, physical examination, and specific procedural skills.
- A "physicianship form," adopted from the University of California, San Diego, was introduced for use in the clinical clerkships in 1999–2000. A version appropriate to the preclinical years has been developed by an ad-hoc task group and is under review by the preclinical curriculum subcommittee.

Clinical Experiences

- In 1991–92 a weekly, half-day office-based preceptorship was introduced for all first-year students. Initially consisting of five to six sessions in both fall and spring semesters, the preceptorship became a 17-session longitudinal experience in the year 2000.
- Beginning in 1998–99, all second-year students were placed with clinical faculty for a four-session comprehensive H & P examination session toward the end of the Introduction to Clinical Sciences course.
- In 1995–96, a six-week family medicine clerkship was added to the clinical curriculum. The lecture portion is case-based, while the clinical portion consists of a four-week office-based preceptorship.
- A weekly, day-long office-based preceptorship has also recently been included in the 12-week medicine clerkship.
- Selected students on obstetrics–gynecology, surgery, and neurology clerkships may also spend time in physicians' offices.
- Altogether, over 250 community-based physicians now provide preceptorships for first-, second-, and/or third-year students as part of the formal curriculum.
- The alumni association also provides a voluntary, early specialty preview (ESP) program in which a first-year student can spend up to two weeks during vacation periods in an alumnus's office learning about the practice of a selected specialty.

- The NJMS is fortunate in having an extensive network of teaching hospitals. These include University Hospital, which is contiguous with the medical school, a veterans' hospital, a rehabilitation institute, and a number of community hospitals.
- This network allows the school to have a clinical curriculum consisting of 68 weeks of required clerkships, including neurology, emergency medicine, and physical medicine and rehabilitation, and an acting internship, in addition to the core disciplines.
- Close monitoring of clinical activities indicates that students have an appropriate mix of inpatient and hospital-based outpatient experiences. The fundamental nature of these experiences has changed little over the past decade.
- Clinical teaching follows an apprenticeship model, where students become integral members of the health care team.
- All students are required to serve an acting internship in one of the core disciplines (except psychiatry) during their fourth year.
- Beginning in 1995, when a family medicine clerkship was introduced and elective time was reduced, options for the acting internship were expanded to include general surgery and obstetrics–gynecology.
- A two-week required clerkship in substance abuse was introduced in 1996. Clinical experiences are provided in a number of community-based treatment programs and counseling centers.
- An affiliation with a school for developmentally disabled children and adults allows students in pediatrics and family medicine clerkships to learn to interact with persons who have limited ability to communicate.

Curriculum Review Process

- The theme for curricular renewal is to promote learning at all levels—among students, among faculty, throughout the institution, and within the community. Specific goals for curricular renewal include:
  - Reduction in total contact time and in the proportion of lecture time
  - Continued increase in small-group teaching
  - Greater vertical and horizontal integration throughout
  - Further strengthening of clinical skills teaching
  - Restructuring as needed to facilitate achievement of the above goals
  - Introduction of a comprehensive OSCE required for graduation
  - Integration of technology, including multimedia and case-based simulations
  - Further enhancement of community service learning activities
  - Institution of a faculty development program
  - Greater recognition of the educational contributions of faculty
- While much of the planning has involved the Committee on Academic Programs and Policies (AP2), its curriculum subcommittees (consisting of course and clerkship coordinators), and the Office of Education, students have been involved at all stages and have, on occasion, played leading roles. Planning activities included:
  - An initial proposal from AP2 and the Office of Education documenting the need for change
  - A public hearing conducted by AP2 for commentary on the proposal
  - Town meetings with students for further commentary
  - Workshops to identify overall objectives for medical student education
  - A student "white paper" recommending specific curricular changes
  - An ad-hoc task group of faculty and students to outline goals for renewal
  - Meetings of the dean and acting senior associate dean for education with department chairs to secure support
  - A final proposal developed by AP2 in concert with department chairs and in the Office of Education
  - Approval by the faculty council
  - Implementation by departments, AP2, and the Office of Education
- The resources necessary to continue the curriculum review include:
  - Faculty, student, and administrator time
  - Research into initiatives at other institutions
  - Logistic support and modest budget for arranging workshops, retreats, etc.
  - An understanding of institutional culture, negotiating and facilitating skills, patience, and a sense of humor
  - Detailed inventory of teaching activities and curricular content
  - Workshops to define clinical skills and to plan a comprehensive OSCE
  - Curricular rearrangement to accommodate more small-group teaching activities
  - Creation of more small-group teaching space
  - Creation and staffing of dedicated clinical skills teaching and testing facility
  - Resources to expand the pool of SPs and support increasing use of standardized and actual patients in clinical skills teaching
  - Initially, external consultant(s) to provide faculty development workshops
  - Resources to support faculty attendance at regional and national meetings

  - Eventually, creation of staff position and budget to support faculty development for full-time faculty and community-based preceptors

Challenges and Unanticipated Outcomes

- The major challenge was in deciding on the scope and magnitude of the curricular renewal. One view, based on student performance measures, was that "it ain't broke, don't fix it."
- An opposite view, shared by many students, was that the curriculum was outdated and that the NJMS had an opportunity to design an innovative program that would establish it as a national leader in medical education.
- A compromise was reached that, while disappointing to the innovators, was progressive and politically feasible. A "quick win" in the form of major restructuring of the first-year curriculum achieved buy-in and has helped in sustaining momentum.
- The dean's commitment of support for faculty development and clinical skills teaching, while not unanticipated, has also had a positive effect on curricular renewal.
- Capital projects now under way will result in construction of ten to 12 new small-group teaching rooms and a clinical skills teaching and testing center, as well as the deployment of an inter-hospital videoconferencing network. This infusion of resources is fortuitous and timely, and is contributing to further innovation.
- An unanticipated development has been a strong emphasis on professionalism. Several projects are now under way to highlight professionalism, in its broadest definition, as a core institutional value, and to strengthen role modeling, teaching, and evaluation of professional behaviors.
- An ad-hoc subcommittee of the Committee on Academic Programs and Policies has developed measures of both process and outcomes of the curricular renewal, including targets for student performance.
- Courses and clerkships are providing annual progress reports of curricular restructuring and changes in instructional methods to the curriculum subcommittees.
- The Office of Education provides monthly progress reports to AP2 and the curriculum subcommittees on other aspects of the renewal.
- Working groups on clinical skills teaching, integration of the preclinical curriculum, and professionalism make periodic reports to their respective committees. A biennial survey of faculty and students to assess satisfaction with the curriculum and with the renewal process is planned.
- A formal process is in place for peer review of all courses and clerkships at least every three years. The review is conducted by a basic scientist, a clinician, and two students. Review materials to be submitted by the course and clerkship coordinator include course objectives, a syllabus, sample examinations, student performance data, student evaluations of the course and clerkship, and students' responses to a number of narrative questions regarding the administration of the course.
- Review of the structure of the educational program is ongoing. Major changes occur every three to four years in order to meet new curricular goals.
  - The preclinical curriculum was completely redesigned in 1991–92. Basic science courses were resequenced, and courses in PBL and the art of medicine were introduced.
  - The clinical curriculum was restructured in 1995–96 to accommodate a new clerkship in family medicine.
  - The preclinical curriculum was again restructured in 1999–2000 to facilitate horizontal integration.
  - The clinical curriculum will be reviewed again in 2000–01 in an effort to provide greater flexibility.

University of Medicine and Dentistry of New Jersey Robert Wood Johnson Medical School

MARIE TRONTELL, MD, AND PAUL MEHNE, PHD

Curriculum Management and Governance Structure

- There are eight schools in the University of Medicine and Dentistry of New Jersey (UMDNJ).
- All eight schools are governed by the bylaws of the university and by independent bylaws of each institution. The university bylaws define the administrative organization of the university and the schools.
- The bylaws of Robert Wood Johnson Medical School (RWJMS) include specific information regarding the administrative organization of the faculty, the school, and the standing committees.
- The dean is the chief administrative officer of the school, with primary responsibility for implementing the mission of the school.
- The dean appoints an associate dean for academic affairs, an associate dean for RWJMS at Camden, and an associate dean for academic and student affairs at Camden.
- The school council, chaired by the dean, includes the department chairs and a representative number of faculty. The council develops policies under the jurisdiction of the faculty and advises the dean, with approval subject to majority vote of the faculty.
- The school bylaws mandate the following standing committees that play a major role in the educational program:
    - Academic standing committee
    - Continuing medical education committee
    - Curriculum committee
    - Graduate biomedical sciences education committee
    - Graduate medical education committee
- The curriculum committee is charged to develop, review, and make policy recommendations regarding the curriculum and to develop standards for the evaluation of the educational program.
- The associate dean for academic affairs and the associate dean for academic affairs of the Camden campus are ex officio members of the curriculum committee, and can vote.
- There are standing subcommittees of the curriculum committee for each section of the curriculum, and a student curriculum subcommittee.
- During the 1990s the curriculum committee assumed an increasingly pivotal role in evaluating the curriculum and serving as an agent for change. This role has included an in-depth evaluation of each required course and clerkship, evaluation of each year of the curriculum, and a commitment to achieving measurable educational objectives.
- The student curriculum committee has assumed the responsibility of coordinating and interpreting student evaluations of each course.

Office of Education

- The Office of Academic Affairs supports the educational program.
- A position of assistant dean for educational programs was created in 1999.

Budget to Support Educational Programs

- Institutional and state funds support the educational program.

Valuing Teaching

- Faculty in each department who are responsible for courses or clinical rotations are identified as course directors or clerkship directors.
- The university and each of its schools are implementing a "master educator" program that will recognize excellent teachers and create a guild that will further enhance the educational missions of each school and the university.
- Teaching excellence is one of the criteria for promotion for all faculty.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The curriculum committee has identified learning out-

comes, based on the AAMC's Medical School Objectives Project (MSOP).
- All courses and clerkships have identified the knowledge, skills, attitudes, and values they target, as well as listing the means by which they determine that the students have met those dimensions. [The matrix is available upon request from the authors.]

Changes in Pedagogy

- A case-based learning course in the first-year curriculum utilizes problem-based learning and Internet-based communication between faculty and students.
- There has been an increased emphasis on small-group teaching, self-directed learning, and computer-based teaching and learning in all courses.
- Cases and clinical correlations are used extensively to anchor basic science concepts.
- Clinical faculty and fourth-year medical students serve as small-group facilitators.
- Standardized patients are used for teaching and student assessment.

Application of Computer Technology

- Students are not required to purchase computers. They have access to medical school computers in the computer laboratory, the teaching laboratories, and the library.
- Many courses are Web-based and use computers extensively.
- Communication with students is done via electronic mail.

Changes in Assessment

- Beginning in 1994, all students have been required to successfully complete the summative Clinical Skills Assessment Exercise that uses an OSCE format to assess student competencies in skills considered essential by the faculty.
- All of the required third-year clerkships utilize either an OSCE or an observed clinical assessment as part of a student's evaluation.
- Assessment methods include standardized patients, faculty observation, and the assessment of problem-based learning skills as reflected in project reports by students.

Clinical Experiences

- Three courses in the first and second years include clinical experience.
- Most of the clinical experiences are concentrated in the third and fourth years of the curriculum.
- In 1993 the third and fourth years were revised extensively to increase the instruction in the ambulatory setting to 50% of the required clerkship time and to incorporate a family medicine clerkship into the third year.
- Students work in hospitals, physicians' offices, outpatient clinics, and neighborhood health centers.
- The current third year includes six required eight-week rotations in family medicine, medicine, obstetrics–gynecology, pediatrics, psychiatry, and surgery.
- The current fourth year includes at least four electives, a required subinternship, and a required rotation in medicine, never in surgery.

Curriculum Review Process

- The curriculum committee is responsible for reviewing the curriculum in whole and in part.
- The office of academic affairs and the faculty are involved actively in this dynamic process.
- The bylaws were revised in 1998 and include a charge to the curriculum committee to conduct an in-depth review of each course at least every three years.
- An educational retreat, held in March 1999 by the curriculum committee, focused attention on ways to increase horizontal and vertical integration in the curriculum. As a result of the retreat, the dean's office and the curriculum committee offered competitive educational grants to faculty who developed projects in these areas.

University of New Mexico School of Medicine

Scott Obenshain, MD, and Stewart Mennin, PhD

Curriculum Management and Governance Structure

- The curriculum changed in 1993 and now requires centralized governance of education.
- Currently, there are two governing bodies for education.
    - The Education Council, a committee of the faculty (formerly known as the Curriculum Committee) makes education policy recommendations to the faculty.
    - The Integrating Group implements and monitors the curriculum. The Integrating Group reports to the dean via the associate dean for undergraduate medical education.
- Prior to the changes in the new curriculum (1993), two steering committees (one for years one and two; another for years three and four) were responsible both for implementation and for evaluation and promotion of students.
- The evaluation and promotion functions, formerly carried out by the steering committees, are currently handled by the committees on student promotion and evaluation.

Office of Education

- The Office of Undergraduate Medical Education was established in 1971.
- The office was enhanced significantly during the 1980s and 1990s as a direct result of funding from the W. K. Kellogg Foundation to support the innovative Primary Care Curriculum and The Robert Wood Johnson Foundation's Program for Medical Education. The latter facilitated the union of the two prior parallel tracks of 15 years' duration.

Budget to Support Educational Programs

- This budget was established originally with the Office of Undergraduate Medical Education (1974) and has been increasing steadily through grant support for innovation in curriculum and education.
- Over time, hard money has replaced grant support for undergraduate medical education.
- Currently, funding is from the state and the dean's office.

Valuing Teaching

- Faculty with primary responsibility for education components and programs are:
    - elected by block committees
    - appointed by chairs
    - self-identified
- In addition, these faculty serve on committees that organize and implement the curriculum. They are recognized and receive credit for their leadership roles in education.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Almost all components of the medical education experience specify learning outcomes.
- Five competencies (communication; clinical skills; critical integration of knowledge; professional attitudes, values, and ethics; and self-assessment) are specified and assessed as part of a series of comprehensive Student Progress Assessments (SPAs) that occur three times over the course of four years.
- There are specific outcomes for student research, clinical skills, rural primary care experiences, individual organ system blocks, and clerkships. They are developed by faculty committees and groups that report to the Integrating Group.
- At the present time, we do not have a unified statement of graduate outcome objectives.

Changes in Pedagogy

- Parallel education tracks existed during years one and two of the curriculum from 1979 to 1995. The two tracks were joined, combining the best of each, extending their innovative features across all four years.

- Student-centered, small-group, problem-oriented, community-based learning is now part of all students' experiences. Formerly such learning was focused more on the students in the Primary Care Curriculum (20 of 73 students).
- All learning experiences are focused around the use of clinical cases from the first day of medical school.
- Integration of learning throughout the four years includes consideration of normal and abnormal; biology, behavior, and population; primary and tertiary care; and urban and rural community experiences.
- Small-group, problem-based learning using cases has been extended beyond the early years of medical education into all of the core clinical clerkships.
- Standardized patients, used during training in clinical skills, selected courses, and clerkships, are a key feature of the Student Progress Assessments.
- Prior to graduation every student is required to complete a research project.

Application of Computer Technology

- Students are required to have computers at entry to medical school.
- Computer technology is used to provide case exhibits in problem-based tutorials, for intranet communication among students, faculty, and staff, and in student-assessment (formative and summative).
- Syllabi and handouts are available electronically.

Changes in Assessment

- A performance assessment of students is administered three times during the four years of medical school.
- This assessment, known as the Student Progress Assessment (SPA), assesses five competencies: (1) clinical skills, (2) communication, (3) critical integration of knowledge (CrIK), (4) professional attitudes, values, and ethics (PAVE), and (5) self-assessment.
- The assessments are administered during the second semester of the first year (SPA 1), during the fall semester of the second year (SPA 2), and as an exit clinical examination in the final year of medical school (SPA 3).
- SPA 3 is a sequential assessment. The first administration is a screening assessment in which the students have the opportunity to demonstrate their skills and abilities in each of the competencies. If necessary, a second attempt is provided six months later.
- Standardized patients are used in an objective structured clinical examination (OSCE) format to assess clinical and communication skills.
- Other methods include multiple-choice examinations, modified essay questions, self-assessment, and essays about professional attitudes, values, and ethics.
- Computers have been used in the SPA in the past; however, at the present time the use of computers occurs primarily during the various block/course assessments.
- In SPA 1, the students are observed by faculty and given feedback on their communication skills.
- Increasingly, SPA methods are also used throughout the curriculum. Individual blocks use modified essay questions in addition to multiple-choice questions.
- Several blocks use computers to administer modified essay questions. Students submit their answers electronically, and receive immediate feedback from the course director.
- Students are observed doing a complete history and physical examination as part of the assessment in the Clinical Skills course.
- Two of the core clinical clerkships administer OSCEs as components of their assessments. One OSCE is administered formatively early in the clerkship and the other at the end. All core clerkships are committed to having OSCEs beginning in March 2001.
- Assessment takes place in the student-centered, problem-based, small-group tutorials. It is based on students' self- and peer-assessments and faculty assessments. This accounts for 30% of each student's grade in Phase 1 of the curriculum.

Clinical Experiences

- Students start clinical training and experience with patients from day one. They learn to perform a screening history and physical examination and develop interviewing skills during the first semester of medical school.
- Students begin learning in community- and university-based clinical settings one afternoon each week. This starts in the second semester and continues through the end of the third year.
- At the end of the first year of medical school, all students spend four to 12 weeks in a primary care community-based setting seeing patients under supervision and refining their self-directed learning skills. Students may elect to return to medical school to begin work on their required research projects. Approximately two thirds of the

students elect to spend the full 12 weeks in the primary care setting.

- Approximately half of the core clerkship experience is ambulatory.
- Every student is required to take a four-week preceptorship outside the academic health science center during the final year of medical school.

Curriculum Review Process

Fifteen years of parallel-track innovations have taught us the value of longitudinal and comprehensive curriculum review and analysis.

- Integration of basic and clinical sciences has been accomplished by extending tutorial learning through the core clerkships and by moving USMLE Step 1 to the end of the third year.
- Student-centered, problem-based learning, lectures, laboratories, and seminars are combined in an interdisciplinary curriculum that takes place in urban and rural ambulatory and inpatient settings.
- Faculty development in teaching, education, and assessment is integral to all programs as part of the continuum of education and practice.
- Comprehensive short-, medium-, and long-term data gathering and analysis are an institutional feature of our innovations.
- The data are reported orally and in writing regularly at the Integrating Group and Education Council meetings and at meetings of departmental chairman, deans, and directors.
- Planning resources are provided by the dean's office and used to support the Office of Program Evaluation, Education, and Research, whose task it is to carry out the evaluation of the curriculum.
- Decision-linked research informs implementation and guides analysis of unanticipated outcomes.
- Annual education retreats based on information acquired from the curriculum review process, Student Progress Assessment data, and faculty perspectives are used to modify the curriculum.

Future Goals

- In the next five years, plans are to introduce more uniform and codified performance assessment throughout the continuum of undergraduate and graduate medical education.
- There is a plan to increase the relevance of the missions of the medical school to the health of the citizens of New Mexico. New and innovative approaches to recruiting and retaining educationally disadvantaged New Mexicans in the health professions are being created.
- Establishing quality assurance and leadership in medical education through faculty development and peer review remains a central mission of the institution.

Albany Medical College

HENRY S. POHL, MD

Curriculum Management and Governance Structure

- This structure is shown in Figure 1.

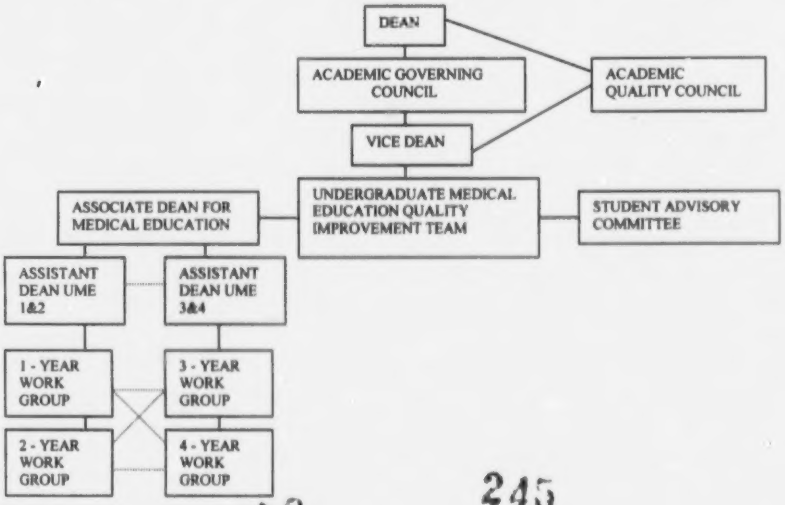
Office of Education

- The design for the curricular renewal process began with a retreat of the faculty in 1983.
- The retreat was followed by the establishment of a "blue ribbon panel," the Ordway Committee.
- This committee conducted a feasibility study to determine the approach to take to revising the curriculum.
- An office of medical education was established in 1987 to support the curricular renewal process.
- A basic sciences forum in the practice of medicine was held and specific task forces were established for each year of the curriculum.
- A "Gang of Four" produced a proposal from the faculty to support the curricular renewal process.
- The faculty voted and approved the renewal plan, monies were secured from a state grant to support it, and implementation began in 1993. Full implementation, with all four years in place, occurred in 1997. Continuous improvement has taken place from 1997 to the present.
- The challenges to the curriculum renewal process included
  - passive-aggressive resistance to change from faculty and staff
  - negative impressions of problem-based learning
  - changes in the executive leadership of the medical school
  - department chairs' reluctance to relinquish power
  - the difficulty of procuring outside funding for change validation and initiating implementation

Changes in Pedagogy

- The themes for the new curriculum begin with the concept that medical school is a four-year process.
- The basic sciences should be stressed throughout all four years of the curriculum.
- Clinical medicine should be taught in the ambulatory setting.

FIGURE 1: Curriculum Management and Governance Structure


DEAN
ACADEMIC GOVERNING COUNCIL
ACADEMIC QUALITY COUNCIL
VICE DEAN
ASSOCIATE DEAN FOR MEDICAL EDUCATION
UNDERGRADUATE MEDICAL EDUCATION QUALITY IMPROVEMENT TEAM
STUDENT ADVISORY COMMITTEE
ASSISTANT DEAN UME 1&2
ASSISTANT DEAN UME 3&4
1 - YEAR WORK GROUP
3 - YEAR WORK GROUP
2 - YEAR WORK GROUP
4 - YEAR WORK GROUP

- The biopsychosocial model interpreted in terms of populations must replace the biomedical model.
- Medical education should emphasize the production of generalists who are capable of interacting with specialists.
- Graduates should be lifelong learners.

Changes in Assessment

- Students are required to pass a fourth-year clinical competency exam.

Curriculum Review Process

- The continuous quality improvement model is fully implemented at the school.
- All curricular offerings are evaluated by students and by faculty, using focus groups and questionnaires.
- The Office of Medical Education provides evaluations of all student performances against which to measure curriculum goals.
- Other means of review include
  - monitoring hours of scheduled class time
  - student attrition rates
  - career choices of graduates
  - geographic distribution of graduates
  - postgraduation questionnaire

Albert Einstein College of Medicine of Yeshiva University

ALBERT S. KUPERMAN, PHD

Curriculum Management and Governance Structure

- In 1996, responsibility for educational policy and planning was shifted from a committee of the faculty–student senate to one that is organized and appointed by the dean and known as the Division of Education (DOE).
- Membership of the DOE consists of 25 faculty, four students, the dean, the associate deans for educational affairs and students, the director of computer-based education, the director of the Office of Educational Resources, and the library director.
- Standing subcommittees include those devoted to the preclerkship, the clinical years, medical student research, computers, and educational support.
- The DOE is charged to monitor and review all aspects of undergraduate medical education; facilitate the design and development of new curricula, courses, and programs; recommend to the dean the allocation of financial resources to support educational objectives; and develop and implement programs for training faculty as educators.

Office of Education

- The Office of Educational Resources was established in 1978.
- This office evaluates all courses and clerkships using student questionnaires and conducting student focus groups.
- The office has the responsibility to plan, organize, and develop (usually in cooperation with interested faculty) programs that help faculty improve their teaching skills.

Budget to Support Educational Programs

- The associate dean for educational affairs allocates funds from the educational budget, which he manages, to implement new DOE initiatives and provide funding for personnel, equipment, and supplies needed to sustain the academic program.

Valuing Teaching

- Each course leader and clerkship director recommends to the associate dean for educational affairs one or two members of the course/clerkship who deserve travel awards to attend a conference or convention, based on their outstanding teaching.
- Each year, several members of the faculty are recommended for induction into the Leo Davidoff Society (for outstanding teaching) or for three different outstanding teaching awards presented at graduation.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- During the 1990s changes in the structure, content, and process of the preclinical curriculum were implemented. The goals of these changes were to help students
  - obtain a more integrated view of normal and abnormal biology
  - become more effective in applying knowledge of biological, behavioral, and population sciences to the solution of clinical problems
  - become successful self-directed learners with excellent information-retrieval skills

Changes in Pedagogy

- The preclinical curriculum includes interdisciplinary courses that reflect unifying themes and concepts of modern biology, linkages between different biomedical science disciplines, and applications of basic knowledge to diagnosis, prevention, and treatment of human disease.
- There has been a significant reduction in class hours, especially lecture hours, with a concomitant increase in unscheduled time.
- Over the past ten years, 270 scheduled class hours have been deleted from the curriculum.
- Course content de-emphasizes the mastery of facts, is less

redundant, and integrates topics representing different disciplines.

- There has been an increase in case-based conferences, with groups of ten to 25 students, in almost all preclinical courses.
- Approximately 50% of the total preclinical curriculum now consists of conferences plus laboratory sessions, clinical encounters, and other interactive educational strategies.

Application of Computer Technology

- Each student is required to own a computer.
- Student housing is wired to the college's network and each student is connected to the network.
- All students have access to electronic mail, educational software, and the Internet.
- There are computers located in every classroom and instructional laboratory.
- Students located at affiliated hospitals have access to electronic mail at designated work stations.
- Every course offered at the college has a Web site that contains course objectives, graphics, images, cases, links to off-campus Web sites, and other material considered helpful to student learning.
- The director of computer-based education works with course leaders, clerkship directors, and faculty to facilitate effective applications of information technology in the teaching program.

Changes in Assessment

- A standardized patient examination is administered at two points in the curriculum, at the end of the second year to assess students' clinical skills, and at the end of the third year to assess students' communication, clinical examination, and diagnostic skills.
- Every clerkship uses an observed clinical encounter and an NBME shelf examination.
- Assessment methods in the preclinical courses are under review with the aim of making them more congruent with learning goals and instructional strategies. The goal is to increase the assessment of problem solving.
- The school is exploring new ways to provide students with feedback on their examination performances.

Curriculum Review Process

- The Division of Education conducted a retreat in 1999 and identified the following areas for particular emphasis:
  - The integration of basic biomedical science and clinical medicine at all levels of the curriculum
  - Improvement and enhancement of assessment and feedback methods
  - Improvement and expansion of physical facilities devoted to education
  - Development of an early and effective mentoring system
  - Continuing attention by different faculty groups to medical ethics, evidence-based medicine, nutrition, and palliative care

Columbia University College of Physicians and Surgeons

RONALD E. DRUSIN, MD, PAT MOLHOLT, PHD, AND HILARY J. SCHMIDT, PHD

Curriculum Management and Governance Structure

- In 1992, the school undertook a comprehensive review of the curriculum. The same year the school received a grant from The Robert Wood Johnson (RWJ) Foundation for curricular renewal.
- The governance of the curriculum was centralized in the dean's office in 1992, when the Office for Curricular Affairs was established to oversee implementation of the revised curriculum. Since it was established, the office has assumed both administrative and budget supervision for an increasing number of courses at the school.
- The associate dean for curricular affairs serves as chair of the Curriculum Committee.
- The Office for Curricular Affairs and the Curriculum Committee are responsible for governance of the curriculum as well as for its quality and content. The office and the committee report to the dean and to the Faculty Council.
- The Curriculum Committee is a faculty–student committee composed of basic science and clinical faculty with two representatives from each medical school class.
- Subcommittees of the Curriculum Committee are charged to address specific issues and report back to the full committee.

Office of Education

- The Center for Education Research and Evaluation (CERE) was established in 1994, during the curricular reform, to serve as a resource for teaching faculty and administration of the health sciences schools (medicine, dentistry, and public health) on effective approaches to teaching and learning.
- The mission of CERE is
  - to provide service and expertise in teaching, learning, and evaluation
  - to support and facilitate continuing quality improvement and innovation in health science education
  - to promote excellence and scholarship in medical education
- The CERE faculty and staff are educational and cognitive psychologists who
  - design rigorous process and outcomes evaluation approaches and instruments for the school
  - consult and provide faculty development workshops on effective new and traditional teaching methods
  - promote scholarship in education through assisting faculty in education research, preparing manuscripts and presentations, and writing grants
  - conduct a test and survey-scanning service for scoring multiple-choice exams and summarizing course-evaluation survey data
- The number of staff in CERE has doubled since 1999.
- The impact of the CERE in the medical school includes
  - improved learning and teaching environment based on evaluation indicators
  - fourfold increase in the number of peer-reviewed publications and presentations in medical education
  - increase in grant funding for educational innovation
  - support for and promotion of a continuously evolving and dynamic curriculum

Budget to Support Educational Programs

- The budget that supports the undergraduate teaching programs is a hybrid.
- Before 1992, all costs for teaching programs were funded by central funds assigned by the dean's office to department chairs. Allocation of the funds was and is at the discretion of the department chairs and financial administrators.
- The RWJ grant was an incentive to define the costs of implementing and maintaining new interdisciplinary courses and programs.
- The budget for implementation and maintenance of the new curriculum was centralized in the Office for Curricular Affairs. However, those courses that are not interdisciplinary are still supported by departmental funding.
- The dean supports the budget for undergraduate medical education from tuition and other income to the medical school. There is no government support for the program.

Valuing Teaching

- Faculty may be promoted in academic rank in a non-tenured track reserved for educators and clinical investigators who have made substantial contributions at the local and national levels.

- There is a separate track for faculty who do the required service in teaching but whose contributions are not significant.
- The university honors five faculty members across all schools each year. Since the awards were established, a member of the medical school faculty has been honored each year.
- Each year the medical school awards a basic science faculty member and a faculty member in the clinical sciences for achievement in medical education.
- Each medical school class honors one faculty member each year for outstanding teaching. The award given by the fourth-year class honors teaching across all four years.
- Since 1998, the third-year class has honored six resident physicians for achievement in teaching and in humanism in medicine, and for being outstanding role models for them during the clerkships.

CURRICULUM RENEWAL PROCESS

- The themes and goals of the curriculum implemented in 1992 include
    - increased focus and relevance of basic sciences to the practice of medicine
    - increased integration within and between basic and clinical sciences throughout all four years
    - improved teaching methods, including a reduction in lectures and an increase in case-based small-group problem-solving sessions
    - improved teaching and integration of the biopsychosocial sciences in all four years
    - integration of content themes, including geriatrics, HIV, sexuality, substance abuse, health care systems, and information systems
    - inclusion of primary care medicine in the core clinical curriculum

Changes in Pedagogy

- The first two years of basic science have been reorganized to highlight integration within and between basic and clinical sciences.
- There has been a substantial increase in small-group, case-based problem-oriented sessions, associated with a concomitant reduction in lectures.
- In the second year, there are rarely more than two hours of lecture per day and at least four to six hours per week of small-group problem solving and/or labs.
- A four-year longitudinal course in biopsychosocial aspects of medicine, including communication, professionalism, ethics, nutrition, the lifecycle, and epidemiology, was created.
- Beginning in the first few weeks of the first year, students have clinical experiences one afternoon per week in a variety of health care settings (e.g., doctor's offices, homeless shelters, hospice, gay men's health crisis center, and school health programs).
- Students participate in journal writing, designed to cultivate reflective practice.
- There is a long-standing required medical humanities program in the second year.

Application of Computer Technology

- Students are not required to own personal computers, although approximately 70% have them.
- The Center for Academic Information Technology maintains four computer labs with 120 networked PCs and Macs. One of the labs is open 24 hours a day.
- All medical student housing has direct network wiring in each student room.
- The school views information technology as a supplement to the core value of the student–faculty relationships. Information technology augments and complements teaching and learning activities.
- Students communicate with course directors and faculty via e-mail, course information is communicated on bulletin boards, and many of the slides and other visuals are available online.
- The goals for the use of computers are
    - assisting faculty in illustrating complex concepts and relationships and making their use of image-based information easier and more effective
    - assisting students in acquiring the knowledge base necessary in the preclinical years
    - enabling efficient access to information
- Computer-based resources serve as a medium for faculty to introduce topics and concepts in the lecture hall and as a study tool for students to use in independent study.
- The histology, neuroanatomy, and pathology courses and some segments of the anatomy course have major computer-based presences in the curriculum.
- Students are encouraged to make independent use of the library's large collection of computer-based resources.

ULS

Changes in Assessment

- The school is a member of the New York consortium at the Morchand Center, initially funded by the Josiah Macy Foundation.
- At the conclusion of clerkships, students' clinical skills are assessed at the Morchand Center using seven standardized patients. Students are assessed by the standardized patients and their encounters are videotaped; each student has the opportunity to review his or her videotaped performance with a faculty member.
- Faculty may observe students in patient encounters for formative evaluations during the clerkships.
- The student evaluation form (completed by their clinical preceptors) has been redesigned to improve performance criteria and standardize the evaluation across clerkships. Preceptors are required to observe directly each student performing a history and physical exam before completing the evaluation form.
- The USMLE shelf exams have been incorporated as a knowledge-evaluation method in clerkships where the content of the shelf exam is a good match with the clerkship knowledge objectives (medicine, neurology, obstetrics–gynecology, pediatrics, and surgery).

Clinical Experiences

- As part of the Clinical Practice course, all first-year students have a required clinical selective. This experience may take place in a variety of community-based clinics and projects.
- The student is assigned to a mentor (who may be a physician, social worker, or nurse practitioner) and is expected to play an important professional role in patient care commensurate with his or her knowledge.
- Clinical instruction in physical diagnosis, clerkships, and electives are offered in a variety of sites.
- The hospital and health system affiliates where students learn are located in inner-city urban centers, suburban environments, and rural areas in New York, New England, and New Mexico.
- Students learn in hospitals, in community-based ambulatory care centers, in physicians' offices, and in Indian Health Services facilities.
- Many fourth-year students spend time in clinical settings away from the school.
- The medical school has established affiliations and opportunities for students to learn in Europe, Australia, Asia, and third-world countries around the world.

Curriculum Review Process

- The Curriculum Committee is charged with ongoing review of the educational program.
- The committee uses evaluation data from sources that include student surveys, exam performances, qualitative feedback from focus groups, internal surveys, and responses to the AAMC Graduation Questionnaire to identify strengths and weaknesses in the curriculum.
- When a weakness is identified, the dean convenes an adhoc committee to examine the problem and make recommendations for changes and improvements.

Future Goals

- The content evaluation will focus on the following issues: nutrition, genetics, gender-based medicine, palliative care, professionalism, and humanism.
- To continue to enhance integration throughout the curriculum and improve teaching and student-assessment methods.

Cornell University Joan and Sanford I. Weill Medical College and Graduate School of Medical Sciences

DANIEL R. ALONSO, MD

Curriculum Management and Governance Structure

- Until 1996, the Weill Cornell Medical College curriculum was of the traditional, "didactic" type, consisting of lecture-intensive courses administered by the academic departments.
- A curriculum committee composed of representatives from all of the departments dealt primarily with general guidelines and global issues and had little authority, especially in the area of curricular renewal.
- With the curricular reform of 1996, a major change took place, resulting in centralization of the governance of the curriculum.
- The curriculum committee was replaced by a governing and coordinating structure that reflects the recent curricular reform, which integrates basic and clinical sciences across all four years and delivers the instructional program via a variety of teaching formats.
- The new structure is the Medical Education Council (MEC), which oversees six committees, each responsible for the following aspects of medical education:
  - Core basic sciences curriculum
  - Advanced basic sciences curriculum
  - Clinical curriculum
  - Curriculum and faculty evaluation
  - Admission to medical school
  - Student assessment, promotion, and graduation
- The MEC is the steering committee for all policy decisions involving the educational programs of the medical college.
- The MEC's authority ranges across the continuum of undergraduate medical education, beginning with the admission process and extending throughout all four years of the medical school.
- All major educational policy decisions and curricular changes must be approved by the MEC. Members may initiate policy changes affecting the educational program or discuss and act upon recommendations referred from other sources, specifically the six constituting committees.
- The MEC has 16 voting members, consisting of the chairs of the core and advanced basic sciences curriculum committees, chairs and vice chairs of the clinical curriculum and faculty evaluation committees, four representatives from the Executive Faculty Council, four from the General Faculty Council, and two student representatives.
- The MEC is chaired by the senior associate dean for academic affairs and staffed by the associate dean for curricular affairs and the director of the Office of Curriculum and Educational Development.
- The MEC is composed of senior faculty who have leadership roles in the educational program; as a result, policy decisions are made by those with direct responsibility for the curriculum. Members have a broad perspective with respect to the institution's educational mission. This comprehensive view diminishes the influences of individual constituencies.
- The MEC is appointed by the dean and generates proposals and recommendations for approval by the Executive and General Faculty Councils. The various committees that are components of the MEC are also appointed by the dean.

Office of Education

- A prior attempt to establish an office of medical education in the early 1980s had been unsuccessful.
- By 1995, an office of medical education was absolutely essential to support the planning and implementation of a complex new curriculum with a centralized governance structure, characterized by interdisciplinary, integrated, sequential block courses featuring pedagogic methods not previously used at Cornell.
- The Office of Curriculum and Educational Development (OCED) was established in the spring of 1996 when planning of the new curriculum was nearing completion.
- Its staff consists of a director/associate dean, an associate director, two curriculum coordinators, an assessment coordinator, an administrative manager, and appropriate secretarial and clerical staff, a total of 11 staff members.
- The OCED was created to help faculty members achieve their full potential as educators and to adapt to new teaching roles required by the new curriculum. Its mission is to:
  - assist the faculty in the implementation and renovation of the curriculum, providing guidance for orga-

nization of interdisciplinary courses, the integration of the teaching of basic and clinical sciences across the four years of the curriculum, and the development and implementation of the primary care curriculum.
- establish an active program of instructional support for faculty, including the development and evaluation of innovative teaching and learning methods. These activities include the development of instructional skills, the design, use, and evaluation of instructional materials, and, in collaboration with the staff of the Weill Education Center staff, the production of computer- and Web-based instructional materials.
- implement a comprehensive and centralized program of student, faculty, and course evaluation, including an accounting of faculty contributions to the teaching program.
- evaluate the effectiveness of educational innovations and curricular programs and, in general, conduct research in medical education.

Budget to Support Educational Programs

- Academic departments continue to receive budgetary support at the level they had prior to the reform of the curriculum in 1996.
- Each department chair distributes the institutional allocation without input from the dean's office. This budget is funded from institutional resources.
- At the time of the introduction of the new curriculum, additional funds were allocated to support the centralized management of the educational program assigned to the Office of Curriculum and Educational Development.
- In addition, a special fund was established by the dean to initially support the participation of clinical faculty in the new curriculum. Four years later, it has evolved into a merit fund used to recognize the teaching contributions of the faculty.

Valuing Teaching

- Faculty development is an integral component of the mission of the Office of Curriculum and Educational Development. The need for this activity was first felt with the introduction of the new curriculum in the fall of 1996, particularly as it called for new teaching modalities such as PBL.
- Currently, faculty development sessions occur in two areas. The first area is the orientation of faculty to the PBL teaching process. All PBL tutors must attend a 90-minute session prior to the start of the course in which they are expected to tutor.
- During these sessions, a portion is devoted to a discussion of the PBL process, identifying specific problems, and promoting problem solving with all of the tutors present.
- Since the beginning of the new curriculum in 1996, 60–80 faculty per year have attended these sessions.
- The second area of faculty development occurs with the yearly offering of a course entitled Faculty Development in Clinical Teaching. It is administered through the Weill Graduate School of Medical Sciences and offers CME credits.
- The seven sessions cover learning climate, control of the session, communication of goals, promotion of understanding and retention, evaluation, feedback, and promotion of self-directed learning. The target group consists of faculty and medicine and surgery fellows interested in enhancing their teaching skills.
- A plan to develop sessions on office-based teaching techniques for the preceptors in the Medicine, Patients, and Society I course is under consideration.
- A session is being piloted this year to enhance the abilities of all faculty to assess student performance.
- A strategic plan for development was endorsed by a committee of the Medical Education Council.
- Ongoing student development in teaching was begun this academic year with the introduction of an advanced basic science requirement. Part of this requirement can be satisfied by students' participating in a four-week elective in which they perform as teaching assistants in basic science courses and take a seminar series in teaching methods.
- A committee that is considering revisions to promotion and tenure policies is discussing modifications to the academic clinical track that may take into account faculty accomplishments in clinical teaching during promotion decisions.
- In conjunction with the new curriculum, Weill Cornell Medical College has instituted initiatives designed to recognize excellence in teaching.
- Among them are monetary bonuses for course directors, a significant increase in the number of teaching prizes that are awarded to the faculty during a "Celebration of Teaching" dinner hosted by the president of the university, the dean of the medical college, and the chairman of the board of overseers.
- There are plans to institute a "teaching portfolio" where educational contributions of individual faculty members will be recorded and made available to department chairs and the committee that reviews tenure and promotion decisions.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The faculty have not yet developed learning outcomes for the educational program.

Changes in Pedagogy

- Until the academic year 1995–96, the Weill Cornell Medical College had a departmentally administered, lecture-intensive, traditional curriculum. Departments determined course content and there was little coordination across disciplines.
- Increasingly aware that the curriculum needed revisions in teaching methods, content coordination, and management, the medical college embarked on a two-year planning process that resulted in a new curriculum characterized by hybrid teaching methods, content integration, and centralized management. It was implemented one year at a time between 1996 and 2000.
- The goal of integrating the learning of the basic sciences, clinical sciences, and clinical practice was achieved by offering interdisciplinary, sequential basic science courses; structuring the sciences into basic and advanced modalities; exposing the students to clinical concepts from the first week of classes; and providing early clinical experiences in physician's offices.
- PBL tutorials (one case per week over 65 weeks in years one and two) develop the students' problem-solving skills and motivation for continued independent study and facilitate the learning of the basic sciences by introducing them in a clinical context.
- Lectures on highly selected topics and small-group sessions (laboratories, seminars, etc.) complement PBL.
- In order to learn how to critically review the biomedical science literature, students present and discuss current papers in a weekly journal club format.
- The strongly positive result of these changes is that students no longer rely on lecture transcripts as their primary source of information. Instead, they use textbooks, seek information from primary sources, and routinely read the scientific literature.
- Highlighting the level of integration achieved, the core basic science curriculum now consists of six courses (down from 14 before). There are only two courses with clinical content offered during the first two years (down from nine before).
- During the first two years, basic science courses are taught four mornings per week, leaving one full day as a "clinical day" dedicated to an introductory clinical curriculum.
- During the second year, students acquire more complex clinical skills (medical interviewing and physical examination), and learn clinical epidemiology, public health, nutrition in illness, diagnostic reasoning, and medical ethics.
- This sequence is completed in the third year during a two-week clerkship that provides experiences in clinical ethics and care at the end of life, and teaches approaches to dealing with medical mistakes.
- Another innovation of the new curriculum is the introduction of an advanced basic sciences curriculum that includes a review course taught by the faculty during the last month of the fourth year and experiences either in biomedical research or in teaching in a basic science course.
- A hybrid curriculum benefits from a similar method of evaluation that is a feature of the Weill Cornell curriculum.
- Students are very comfortable and seem to like the new approach. They appreciate being treated as adult learners, enjoy learning science in a clinical context, and welcome the early introduction to doctoring. Faculty are proud of the change and energized by the innovations.

Application of Computer Technology

- Students are not required to own computers, but they have easy access to the 116 computers in the Weill Education Center, which is open 24 hours a day, seven days a week.
- Computer technology is well integrated into the educational program.
- The education center is equipped with 116 computer workstations, which amounts to one computer to every two students in the majority of classrooms, and one computer to three students in the remaining classrooms. These are networked and have Internet access.
- Computers are used extensively and, within the preclinical curriculum, as a source of information during problem-based learning (PBL) tutorials (consulting online textbooks and other electronic resources), displaying patient-related materials (imaging studies, patient or lesion photographs, etc.), online entry of answers to the first step of "triple-jump" examinations, and selected basic science exams.

Changes in Assessment

- Student performance is assessed by a variety of methods that include a combination of weekly quizzes, subjective evaluation by tutors, and "triple-jump" examinations with an oral component.
- Two student classes in the new curriculum have now taken the USMLE Step 1 and their performances have been outstanding, surpassing by a wide margin those of the preceding classes that learned under the previous curriculum.

Clinical Experiences

- "Clinical Day" consists of a two-year sequence centered around the patient–doctor relationship that encourages students to develop a professional identity, provides an opportunity for students to talk with patients while seeing them in their contexts, facilitates the gradual acquisition of clinical skills, and permits experienced physicians to observe students in the office environment and provide feedback.
- Weill Cornell Medical College does not have a department of family medicine. However, the new curriculum has introduced a highly successful, eight-week primary care clerkship offered entirely in the ambulatory setting, consisting of general internal medicine, general pediatrics, obstetrics–gynecology, psychiatry, and the primary care aspects of the surgery specialties and dermatology. It also includes experiences in family medicine clinics at the Brooklyn Hospital Center.

Curriculum Review Process

- Weill Cornell Medical College introduced a formal process for curricular review in 1997, one year after the beginning of the implementation of the new curriculum.
- There was a consensus among the planners of the 1996 curriculum that this latest curricular revision was very significant and radically different from previous efforts.
- It was agreed that this curriculum would be a dynamic educational instrument that would evolve and change according to experience. To assure this, a review process with two components, General Educational Program Review and Individual Course Reviews, was established.
    - *General Educational Program Review.* Every summer the Office of Curriculum and Educational Development organizes a curriculum retreat attended by teaching faculty and student representatives. The two-day event is preceded by a mini-retreat that determines the agenda topics. These are discussed in plenary sessions and break-out groups and the consensus recommendations are referred to the Medical Education Council for further deliberation and/or action.
    - *Individual Course Reviews.* At least once a year, the core basic science and clinical curriculum committees review courses or aspects of courses, as appropriate.
- In addition, there is a plan to carry out a comprehensive curricular review every five years. Issues for future consideration include faculty development, student and course evaluation, recognition and reward of faculty teaching, and curricular outcomes.
- Weill Cornell Medical College has just completed the first implementation of a new curriculum. By design, the planning process was relatively short (two years) and carried into the four-year period of implementation.
- The dean's leadership was fundamental in achieving a significant curricular renewal.
- The planning committee was composed of institutional leaders with extensive experience and interest in medical education and was chaired by the academic dean, who served as a middle management "catalyst" for reform.
- The vast majority of the faculty supported the process, and those who opposed it sincerely felt that, at least in their disciplines, the traditional curriculum does a better job of delivering the information.
- Considerable resources were committed to the renewal process.
- Since no funds from the academic departments were used, new institutional resources were allocated to support the planning process, the creation of an office of medical education, and a curriculum support center, and to provide incentive and merit funds.
- Although in the planning for many years, the coincidental completion of the new Weill Education Center when the curriculum began added to the success of the new curriculum.

Mount Sinai School of Medicine

ALEX STAGNARO-GREEN, MD, AND LAWRENCE SMITH, MD

Office of Education

- The Department of Medical Education was created in 1968.
- The department began weekly medical education grand rounds in 1994.
- The Office of Curriculum Support and Medical Education Research was created to support the implementation of the new curriculum.

CURRICULUM RENEWAL PROCESS

Rationale for Curricular Change

- There was a need to define the core scientific knowledge that forms the basis of medical practice.
- There was a need to employ innovative pedagogic methods and technologic advances to stimulate active learning.
- There was a need to train physicians who are responsive to the society in which they will practice medicine.
- The process presented an opportunity to encourage educational creativity in the medical school faculty.

Learning Outcomes

- The goal of the new curriculum is to train physicians who will be
  - imbued with a core knowledge of the biologic basis of human function in health and disease
  - critical thinkers dedicated to lifelong learning
  - dedicated to the highest degree of professional behavior
  - committed to serve the society and community in which they live
- Key aspects of the new curriculum include
  - interdisciplinary education throughout all four years
  - self-directed learning through various educational modalities
  - curricular organization that reflects a logical learning sequence
  - clinical experiences throughout all four years
  - computer-assisted instruction in every course and clerkship
  - teaching of selected disciplines across the entire curriculum
  - an evaluation system that reflects the teaching modalities employed
  - teaching and evaluating critical thinking skills
  - unique opportunities for research and in-depth scholarly activities

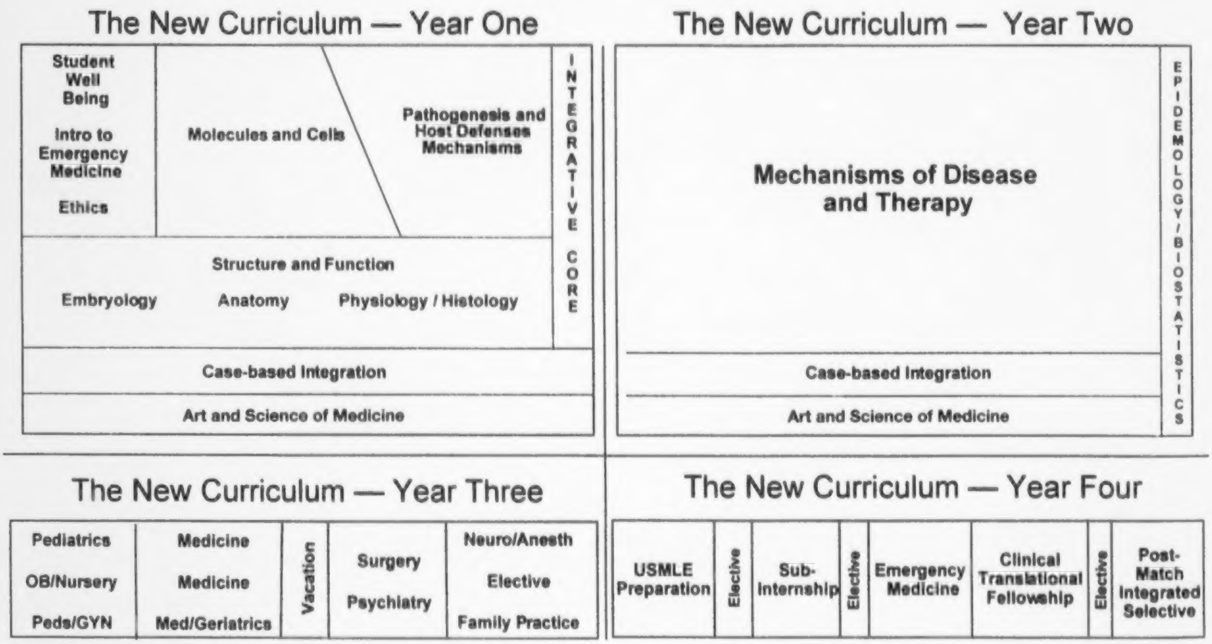
Changes in Pedagogy (See Figure 1)

- The curriculum includes a maximum of two lectures daily. The role of the lecture is to frame key concepts and to present instructive examples.
- Small-group interactive learning is utilized for case-based learning, problem-based learning, and computer-assisted instruction.
- A novel six-week block at the end of the first year is called the Integrative Core. It consists of in-depth analysis of selected topics relating science to medicine, conducted in graduate-school–style seminars.
- Standardized patients have been an integral component of the educational system for the last ten years and their use will be expanded in the new curriculum.
- Large-group, interactive sessions are used for integrative case conferences.

Application of Computer Technology

- Students are not required to own computers. There are 125 computers available for students within the medical school.
- There is a four-year longitudinal medical informatics curriculum.
- A virtual classroom has been created.
- The intranet is used to disseminate on-line course materials to students.
- Computer technology is being applied to evaluate the impact of the new curriculum on students and faculty.

FIGURE 1: Structure of the New Curriculum


The New Curriculum — Year One
Student Well Being
Intro to Emergency Medicine
Ethics
Molecules and Cells
Pathogenesis and Host Defenses Mechanisms
INTEGRATIVE CORE
Structure and Function
Embryology
Anatomy
Physiology / Histology
Case-based Integration
Art and Science of Medicine
The New Curriculum — Year Two
Mechanisms of Disease and Therapy
EPIDEMOLOGY/BIOSTATISTICS
Case-based Integration
Art and Science of Medicine
The New Curriculum — Year Three
Pediatrics
OB/Nursery
Peds/GYN
Medicine
Medicine
Med/Geriatrics
Vacation
Surgery
Psychiatry
Neuro/Anesth
Elective
Family Practice
The New Curriculum — Year Four
USMLE Preparation
Elective
Sub-Internship
Elective
Emergency Medicine
Clinical Translational Fellowship
Elective
Post-Match Integrated Selective

Changes in Assessment

- Mechanisms for formative assessment in year-one and year-two courses are under development.
- Year-end competency and/or progress testing has been introduced for the first and second years
- The current fourth-year OSCE has been expanded to encompass new curricular and graduation goals.

Clinical Experiences

- Clinical experiences begin in week one of the first year and continue through the second year with the Art and Science of Medicine course.
- Clinical experiences occur in
  - hospitals (tertiary care, community, and Veterans Administration)
  - ambulatory settings (hospital clinics, physicians' offices, community-based ambulatory settings, the public school system)
  - nursing homes
  - emergency rooms
  - hospices
- In the third year, students will have integrated clerkship experiences.
- In the fourth year, students will be required to participate in skill-intensive patient-responsible clinical experiences.

Curriculum Review Process

- There are online student evaluations of courses and clerkships.

New York Medical College

SUSAN KLINE, MD

Curriculum Management and Governance Structure

- New York Medical College is a private, freestanding, nonprofit institution governed by its own Board of Trustees. Trustees provide active oversight of all financial and policy matters of the college.
- The president of the college reports directly to the Board of Trustees. The president is the chief executive officer of the college and oversees all aspects of college operations, including finance, academic policy, fund raising, and planning.
- The college consists of three schools: the School of Medicine, which is the largest and oldest school (1860), the Graduate School of Basic Medical Sciences (1963), and the Graduate School of Health Sciences (1981). The university, in recognition of the need for a chief academic officer, in 1996 appointed a provost, who also serves as the dean of the School of Medicine.
- Shortly after his appointment, the dean revised the administrative structure of the medical school, decreasing the number of direct reports and improving administrative and academic management.
- In the administration of the medical school, an executive vice dean for academic affairs, a vice dean for affiliations and faculty practice, and a senior associate dean for academic administration support the dean.
- Reporting to these individuals are senior associate and associate deans in the following areas: undergraduate and graduate medical education, administration, student and minority affairs, admissions, continuing medical education, primary care education, Fifth Pathway, Medical Sciences Library, university registrar, student financial planning, research administration, affiliation administration, faculty practice, and academic administration.
- An associate dean has been delegated responsibility for faculty development. Each of the medical school's teaching affiliates, academic health centers, and university and major teaching hospital affiliates has a vice dean or associate dean, who usually also serves as the hospital's medical director.
- Organizational decision making and faculty participation in medical school committees are closely related at the college. The dean formally consults the chairmen, the associate deans of each of the teaching hospitals, and the president of the Faculty Senate during monthly meetings. Faculty committees advise the dean on a variety of issues, particularly curriculum, admissions, research support, animal care, and compensation. This structure supports an appropriate and inclusive decision-making process.
- The curriculum committee, consisting of two students from each of the four classes and faculty members who broadly represent the basic and clinical sciences, likewise evaluates, coordinates, and provides oversight to the curriculum.
- Four standing subcommittees (the preclinical years subcommittee; the clinical years subcommittee; the primary care subcommittee; and the evaluation, outcomes assessment, quality assurance subcommittee) work together through overlapping membership and workgroups to promote coherence and coordination throughout the curriculum.

Office of Education

- The college maintains the strength of its academic programs through a well-informed, proactive Office of Academic Affairs, whose leadership identifies new and emerging national trends and "best practices" in medical education.
- The office keeps the dean, the faculty, and the curriculum committee abreast of these developments. It also provides staff support for the curriculum committee and has responsibility for dissemination and implementation of decisions, policies, and procedures.

Budget to Support Educational Programs

- New York Medical College is in sound financial condition. The college is more capable of meeting the needs of its educational mission than at any time in the past two decades.
- Management of available resources has permitted important investments in curricular innovations in both basic and clinical sciences, has provided for development of "distance learning" capabilities, expanded housing options, and improved audiovisual and computer-based learning resources. These investments, in turn, have

helped to raise the school's educational profile, enabling recruitment of highly qualified students.

- The sources of funding to the college have shifted somewhat over the years. Six years ago, funding came from three roughly equal sources: reimbursement from affiliated hospitals (37%); faculty practice plan (35%); and college and all other sources, including tuition, research grants, and contracts are (28%).
- While revenues from the various sources are not exactly comparable to those six years ago, approximately 25% constitutes reimbursement from affiliated hospitals, 36% is from faculty practice plans, and 39% is from college and all other sources, including tuition, research grants, and contracts.
- The college endowment has increased nearly 50% since 1993, from $36.9 million to $53.9 million. Although modest in comparison with other medical schools, it has enabled the college to use the unrestricted portion creatively, maximizing benefit to the school. In fact, the amount of income available to support academic activities grew threefold, from $754,000 to $2.1 million, during this period.
- The college initiated a reengineering process in 1997 and has achieved a total of $9.7 million in expense reduction and revenue enhancement.
- Overall, important strides have been made toward developing balance among the sources of support to the school. However, reliance on practice-plan income to support clinical faculty is an ongoing concern. Although it has not yet had a profoundly negative impact on faculty teaching time, there is still concern that additional pressures on physician reimbursement may become problems.
- In examining the disposition of resources with respect to the various activities and the objectives of the medical school, it is generally agreed that the current allocation has supported growth and development of the medical school.
- Funding has been available for innovations related to the educational program, particularly in the following areas: standardized patient exams, standardized history and physical exams, teaching associates for gynecologic exams and male genitourinary exams, as well as significant improvements in the audiovisual resources that support the educational program (including the acquisition of two Harvey teaching models).

Valuing Teaching

- Faculty members number more than 2,400 physicians and scientists representing a broad mix of medical and scientific disciplines. Their various specialties and notable quality meet the education, research and service objectives of the college.
- While there has been a net decrease of 6% in total faculty since 1993, the number of full-time faculty has increased by 37 (or 4%), to 1,022. Two thirds of the increase has been in the clinical sciences and one third in the basic sciences.
- His or her chair and the dean, as part of the biennial faculty reappointment process, evaluate each faculty member. This review focuses on faculty members' credentials, teaching, research, and other relevant activities to determine whether the level of academic activity merits reappointment.
- Written guidelines have been promulgated for both promotion and tenure. These were recently revised by the faculty tenure, appointment, and promotion committee to clarify some concerns with regard to the use of modified titles.
- Teaching continues to be an important criterion for advancement, an acknowledgement of the school's emphasis on education as its central mission. That emphasis is also supported by two tenure tracks available for advancement of full-time faculty. The two tenure tracks (academic and clinical) differ in their emphases on original research but both require a mix of scholarly activities.
- With an increase in support and the assignment of an associate dean to coordinate an ongoing program, faculty development has become much more comprehensive and accessible to those who need to improve their teaching skills or research opportunities. The broad initiatives of the program are designed to strengthen the academic culture, promote academic socialization, develop instructional programs on teaching techniques, establish mechanisms that guide faculty career development, and assist faculty in their efforts to obtain extramural research funding.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In the fall of 1997 the dean appointed an ad-hoc committee of the faculty to develop educational objectives for the college curriculum. These objectives, proposed by the committee and eventually approved in 1998, were guided by the objectives developed by the AAMC's Medical School Objectives Project.

- New York Medical College's educational objectives are divided into four broad categories: knowledge, skills, dutifulness, and altruism. There was little disagreement about the final form of the adopted set of objectives. Nevertheless, there was considerable debate about how certain topics would be presented in the curriculum and whether valid and reliable methods of assessment are currently available for certain of them, especially those dealing with values and attitudes.
- The curriculum committee, in adopting the objectives, fully recognized the inherent difficulty in addressing these issues but felt that an ongoing dialog would help to define more explicitly what students should be learning in the broadest sense (including values and attitudes).
- The college is convinced that that these educational objectives are a clear statement of the knowledge, skills, attitudes, and values that will be needed by our graduates to practice medicine in the future.
- While most of the educational objectives were already addressed in the existing curriculum, the department chairs, curriculum committee, and course and clerkship directors have been asked to maintain an ongoing review of the objectives in planning their respective portions of the curriculum.
- Faculty members have been asked to make necessary modifications in either content or evaluation methods in order to assist in achieving and documenting stated objectives.
- The Office of Academic Affairs is in the process of putting the entire medical school course of study up on the AAMC's newly available Curriculum Management and Information (CurrMIT) database.

Changes in Pedagogy

- The college's educational program provides a broad-based curriculum consisting of 137 weeks of mandatory courses and a minimum of 18 weeks of electives that prepare the student for all medical career options. The curriculum represents a broadly defined faculty consensus on the knowledge, skills, and attitudes to be instilled during a physician's education before he or she begins the more narrowly focused programs of graduate medical education.
- The college fosters the education of physicians who have strong basic science and clinical science knowledge and skills by promoting curriculum integration between the two areas, between the clinical education program and the practice environment, and between the college and the community.
- The increased emphasis of the college on primary care education has resulted in several major curricular revisions that have affected all four undergraduate years and postgraduate education. In 1993, the college was selected by The Robert Wood Johnson Foundation for participation in the Generalist Physician Initiative. With the goal of promoting excellence in general medicine, significant efforts have been made to ensure that the college provides a general professional education that prepares students for all career options in medicine. Major changes included the addition of a required first-year course, Introduction to Primary Care, a required third-year family medicine clerkship, a required fourth-year geriatrics rotation, a mandatory clinical rotation in palliative care, and an expanded biomedical ethics course.
- Students who have shown an early commitment to entering primary care are offered the opportunity to enter an innovative six-year program combining undergraduate education and residency training in internal medicine. Three or four students per class have taken part in this program, which has been favorably reviewed and approved by the American Board of Internal Medicine and the Health Care Financing Administration (HCFA).
- For other required courses, a systematic review has occurred in conjunction with the college's Center for Primary Care Education and Research to ensure that the content of clinical rotations focuses on areas that all physicians should learn while in medical school. In addition, several elective courses have been developed to afford students opportunities to gain additional experience in areas that have general applicability. These include the Lucy Squire radiology course, advanced computer applications to health care, clinical pathology, and laboratory medicine, advanced EKG analysis and cardiac electrophysiology, emergency medicine clerkship, and a hospice care rotation.
- All of the basic science courses have integrated clinical correlation sessions that use faculty members from the clinical departments as instructors and small-group discussion leaders.
- All of the clinical departments emphasize evidence-based medicine and scientifically validated practice guidelines in patient care and teaching.
- An increasing number of clinical departments are offering specialized courses designed by basic science faculty for residents and medical students at hospital sites. This renewed emphasis on integrating the basic sciences with clinical training has been strongly supported by chairs and faculty members.
- The college also provides special opportunities for students interested in pursuing research careers in medicine. The joint MD PhD program is offered in conjunction with the Graduate School of Basic Medical Sciences.

- Summer research fellowships are available between the first and second years of medical school. Up to 25% of the class regularly takes advantage of the funded summer research opportunity. Students who have become involved in either basic or clinical research in the fellowship program may continue working on approved projects throughout the remainder of medical school. In addition, up to two months of elective time may be taken in the fourth year to pursue an approved research project. Students are permitted to use the research elective time to complete data analysis and prepare manuscripts for publication.
- Students who have strong career interests in medical administration may take a joint MD/MPH program in conjunction with the Graduate School of Health Sciences. This program has been very successful, with up to 20 students per class enrolled in degree programs in such majors as health policy and management.
- The college's basic science departments use both innovative and traditional instructional models. During the past several years, the basic science departments have introduced more interactive teaching and learning programs and case studies.
- Three major changes in the first year have significantly improved the curriculum: the introduction of 15.5 hours of teaching in biomedical ethics in a lecture and small-group discussion format, expansion of the primary care preceptorship to accommodate the entire class, and integration of neuroscience and behavioral science into a single teaching block. Even though there have been many innovations in the curriculum since 1993, additions have generally been balanced by condensation or deletion of less relevant or outdated material.
- All the courses in the preclinical years now use the small-group teaching format for breakout tutorials and problem-based discussion sessions. This change has been accompanied by a significant decrease in large lectures.
- The curriculum ensures that students have dedicated time for self-directed study by scheduling it into the normal work week. While there has been constant pressure to encroach on this dedicated time for other curricular purposes, the curriculum committee has resisted doing so. Many students have used this time to initiate student-led small-group study and review sessions, often with the participation of knowledgeable upperclassmen, and to take advantage of the college's wealth of computer-assisted learning resources available through the college library and the Alumni Computer Laboratory.
- The variety of hospitals available for the clinical years is viewed as a particular strength of the medical school and, while students are aware of the difficulties this presents in terms of coordination and standardization of experience, they believe that the breadth of the experience warrants the effort. Standardization has been greatly improved as a result of the student liaison committee, a group of third-year students at each training site. The committee meets quarterly with the executive vice dean for academic affairs and the appropriate senior associate or associate dean to discuss educational program quality, student mistreatment problems, and general student life concerns.
- The School of Medicine has a formalized career-counseling program that begins in the middle of the third year. It includes assigned faculty advisers, career decision workshops, and access to the executive vice dean, the senior associate dean, and two associate deans for career guidance. As part of this program, students must see their faculty advisers or an associate dean to obtain approval for each fourth-year course to be taken.
- The medical school recently instituted a faculty-friends program, which students begin immediately upon matriculation.
- Beginning in 1999, college faculty members have been trained in the MedCareers Program of the AAMC, and they introduce this career-counseling initiative starting in the first year. Other informal sources of career counseling include student organizations, specialty clubs, and residency fairs.

Application of Computer Technology

- Students are not required to own computers, although this is under consideration.
- Computer resources are generally easily accessible on the Valhalla campus. Each of the buildings is networked to the college's LAN and consequently to the Internet. Each student dormitory room is wired for direct network access, and there is a direct connection to the Westchester Medical Center.
- Connections to off-campus affiliates are being added as quickly as possible, with several of the hospitals already fully connected via T1 linkages; the 95th Street dormitory is internally wired with Ethernet and the current dial-up connection is being replaced with a dedicated T1 linkage.
- In recent years, computer resources have expanded in both availability and utilization.
- Computer-assisted learning has been integrated into the instruction of medical students, particularly in the preclinical years.
- The required computer literacy course in the first year integrates assignments with those in anatomy, biochemistry, physiology, neuroscience, and behavioral science.

- New Web-based tools are allowing faculty to build their own on-line learning modules and exams. The library collection is now Web-searchable, and the on-line resources provided by the library are growing exponentially.
- During the clinical years, medical students are expected to familiarize themselves with the clinical use of computers to retrieve laboratory values, patient records, and digital images.
- Third-year students learn to use the computing resources at clerkship sites and use the Web to retrieve bibliographic references about the medical conditions of the patients.
- There is a fourth-year, independent study elective, "Computers in Health Sciences," that has been taken by approximately 70% of the students.

Changes in Assessment

- Student assessment and feedback take many forms during the clinical years. These include:
    - the presentation of new patients
    - daily bedside teaching
    - weekly submission of patient write-ups with management plans and bibliographic references
    - presentations of research topics
    - formal oral examinations
    - the observed history and physical
    - miniboard exams
    - observed structured clinical evaluations (OSCEs)

Clinical Experiences

- The college's four affiliated university teaching hospitals (Westchester Medical Center, Saint Vincent's Hospital and Medical Center of New York, Metropolitan Hospital Center, and Our Lady of Mercy Medical Center) and two affiliated major teaching hospitals (Sisters of Charity Medical Center and Sound Shore Medical Center of Westchester) provide the overwhelming majority of clinical experiences, both inpatient and outpatient, for medical students.
- The clinical facilities provide an extraordinary diversity of patients, community settings, and organizations that enriches the students' educational experience.
- A recent merger of Saint Vincent's Hospital and Medical Center of New York with the Catholic Medical Center of Brooklyn and Queens and the Sisters of Charity Medical Center will significantly increase the college's teaching resources, especially in primary care and ambulatory sites.
- In addition to benefiting from the large volume of patient cases afforded by 120,000 annual inpatient discharges, nearly 1.5 million ambulatory visits, and more than 350,000 emergency department visits, students at these affiliated hospitals are also able to interact and learn from patients who differ greatly from one another racially, ethnically, and socioeconomically. Two of the six hospitals are located in Westchester County, a New York City suburb counted among the wealthiest counties in the country; the other four are located in New York City itself.
- The variety of locations and levels of care provided by the college's affiliated teaching hospitals is such that students benefit from a sound balance of chronic care, community hospital, specialized tertiary care, and primary care ambulatory sites. The array of clinical experiences and choices available is more abundant than in most medical schools in the nation.
- Medical students are able to select from among a number of hospitals for their clerkships. Most rotate through at least four hospitals during their third and fourth years. Thus, the standardization and coordination of undergraduate medical education curricula among these training sites are high priorities. The systems that are in place to assure a standardized, well-integrated curriculum are anchored by an associate dean or vice dean appointed at each of the clinical teaching facilities. These deans administer, evaluate, and supervise the overall quality of the educational programs at each hospital and, along with senior faculty members, possess authority consistent with their responsibility for education of medical students.
- The college has restructured affiliation contracts with its six major teaching affiliates. The revised affiliation contracts provide the college with the necessary authority to ensure that the hospital and the faculty at these sites function in a manner that supports both exemplary patient care and undergraduate and graduate medical education. The new affiliation contracts are judged to be highly effective and have resulted in positive advances in fostering curriculum standardization, cooperation, and good communications among the medical school and the affiliates.

Curriculum Review Process

- Since 1993, various internal and external measures have continued to yield highly favorable ratings of the strengths of the educational program.

- External measures include student performances on the NBME Parts I and II, responses by residency program directors to questionnaires regarding graduates, the numbers of graduates who are licensed and board certified, responses to the AAMC Graduation Questionnaire, and the number who teach in U.S. medical schools.
- Internal measures include student performances on internally written exams, standardized patient exams, OSCEs, laboratory sessions, seminars, small-group conferences, and clerkships.
- Student evaluations of faculty teaching, courses, and clerkships are used to assess the quality of education. This array of measures and methods provides the college with a multidimensional view of educational program effectiveness.
- Another measure is the positive result of the national residency matching program: approximately 97% of students match in their desired specialties, approximately 50% match with their first-choice programs, and 75% match at one of their top three program choices. This is particularly remarkable because many of the students apply to programs in the most competitive areas of the country, especially California and New England. Similarly, data obtained from the American Board of Medical Specialties indicate that 97% of New York Medical College medical school graduates become board certified in at least one specialty, and an increasing percentage is becoming board certified earlier in their careers.
- Internally collected data confirm this positive judgment of the college's graduates. Responses to questionnaires sent to residency program directors indicate their high satisfaction with college graduates. These program directors have given New York Medical College graduates high ratings in a number of critical areas: clinical competence (4.1 on a five-point Likert scale); commitment to continuous learning (3.9 on a five-point scale); and, of 580 responses, only 6% received less than a superior rating. In parallel alumni surveys, graduates of the college indicated that their medical school education had instilled a clear commitment to lifelong learning (4.0 on a five-point scale).

New York University School of Medicine

SHARON K. KRACKOV, EDD, AND STEVEN B. ABRAMSON, MD

Curriculum Management and Governance Structure

- The dean has overall authority for the educational program of the School of Medicine. He has invested the vice dean for medical education with responsibility for the undergraduate curriculum.
- Oversight of the content and quality for each thematic unit resides with department chairs. The chairs appoint course directors and faculty for each thematic unit.
- The basic science courses have been organized into modules representing thematic content. Each of the modules is directed by a senior faculty member appointed by the dean.
- Open lines of communication and dialogue among the deans' office, department chairs, and faculty and regular meetings of leaders of the thematic units foster development of an integrated curriculum.
- In September 1999, at the direction of the dean, a reorganization and expansion of the dean's office was mandated in order to create the infrastructure necessary for central oversight of the curriculum.
- The former associate dean for curriculum was appointed vice dean for medical education. A faculty member who had served as a module and course director was appointed associate dean for medical education. In 1999 a new position for an associate dean for educational program development was created.
- Together, these individuals provide enhanced oversight and administrative leadership for the curriculum and development of new programs. The vice dean and associate deans have a strong leadership role in the process of curricular reform. They and other members of the dean's office focus attention on the areas that would benefit from change, initiate activities, and keep the change process moving forward.
- The dean's office provides leadership and oversight through a variety of other mechanisms.
- Module directors meet regularly with the deans' office to provide oversight and plan the evaluation of the interdisciplinary curriculum.
- The recent appointment of a new chair and co-chair of the Curriculum Committee has strengthened the educational governance of the curriculum; they represent both basic and clinical sciences and foster an active role for the committee. Through their leadership, the Curriculum Committee is currently focusing attention on a critical review of the clinical clerkships in conjunction with the curricular reform.

Office of Education

- The office, under the direction of a medical educator, has been instrumental in creating a review of faculty teaching efforts.
- Currently, the office serves as an educational resource for faculty in development of course objectives, syllabi, and teaching modalities.
- The office maintains a centralized comprehensive plan for evaluation of all courses and the overall educational program.
- The office's faculty development activities include both one-on-one consultations and workshops to support the goals of the curriculum.
- The office has supported a series of Medical Education Colloquia involving a series of five to six lectures and workshops annually by nationally recognized experts in various aspects of medical education.

Budget to Support Educational Programs

- After the self-study and site visit by a team representing the LCME in 1993, a formal budget allocated to the education program initiatives was developed.
- The budget is managed by the vice dean for medical education and is funded by tuition and fees.
- At the current time, there is no mission-based budget that directly allocates dollars to faculty teaching efforts.

Valuing Teaching

- The school has begun to recognize faculty's contributions to medical education. Recent examples include a request for proposals for competitive awards to faculty in support of educational projects, and the Dean's Recognition Citations for Excellence in Medical Education, the first of which were awarded to course directors in the spring of 1999.

- The Task Force 2001 Report, which is guiding the current process of curricular change (see below), reinforced the importance of articulating that a major commitment to the education program has significant value to the institution. The report recognized that promotion to a higher rank is based on excellence and evidence of academic achievement and recommended that the criteria by which faculty are evaluated for promotion and tenure should be clear.
- A dean's committee to review policies of promotion and tenure, particularly as they pertain to the teaching faculty, was established to make formal recommendations in this regard. The Task Force Report recommended that policy development in this area involve assessment of the individual's contribution to the educational program, an element of peer assessment, and teaching portfolios.
- The school will use feedback from both faculty and students to create a mechanism to recognize and reward teaching efforts.

CURRICULUM RENEWAL PROCESS

New York University School of Medicine is currently in the midst of curricular reform and design of Curriculum 2001. The curriculum planning process at the School of Medicine evolved from a history of ongoing educational revision that has occurred within the context of national reform. The current plans for curricular revision are based on the work of the Task Force on Curriculum Policy 2001 and the institutional self-study that was performed in conjunction with the accreditation site visit in January 2000. These committees produced detailed recommendations in their reports, Task Force on Curriculum Policy 2001: Background and Recommendations and Report of The Committee on the Educational Program for the MD Degree. The plans for curricular renewal are characterized by three overarching goals and an action plan based on six curricular recommendations.

- Overarching goals

The following goals guide the curriculum planning process:

  - Develop a rich, evolving, contemporary curriculum, founded in the science of medicine, that unfolds over the four years of study
  - Emphasize self-directed learning throughout the curriculum
  - Identify and recognize our most qualified and excellent teachers

- Six-point plan

The recommendations of the Curriculum 2001 Task Force are summarized in a six-point plan:

  - Develop thematic content units that will promote vertical and horizontal integration throughout the four years of instruction
  - Enrich the teaching of basic medical science in the clinical years
  - Ensure that the core clinical clerkships provide equivalent and high-quality learning experiences across sites
  - Cultivate a culture of scholarship, mentoring, professionalism, and humanism throughout the curriculum
  - Develop uniform methods of formative and summative assessment that are consistent with course objectives across all four years
  - Create policies to specify teaching expectations and recognize the faculty's teaching role

- The new NYU Master Scholars Program is a significant feature of curricular renewal. The overall mission is creating a fabric of learning that promotes principles of humanism and professionalism throughout all aspects of the education of physician–scholars.

Learning Outcomes

- The faculty has not prepared a formal list of specific outcomes that students must demonstrate prior to graduation.
- During the past year, all preclinical and clinical courses have articulated specific learning objectives for knowledge, skills, and behaviors.
- The school is moving toward refining the systems for assessment of student performance with the goal of linking performance-based assessments to these objectives.

Changes in Pedagogy

- Since the institutional self-study in conjunction with the LCME visit in 1993, there has been progressive modification of the curriculum towards increased small-group teaching and self-learning.
- Changes have included an increase in small-group teaching (currently approximately 55% of total preclinical contact time).
- Cases are used to introduce concepts to students. In addition, there has been a reduction in the total amount of direct contact time in order to increase the opportunities for independent learning.
- Standardized patients are used for teaching/assessment in the ambulatory care clerkship; their use may increase in Curriculum 2001.

Application of Computer Technology

- Students are required to have computers.
- The use of computers in learning will increase dramatically in Curriculum 2001.
- Since 1996, the school has increased the emphasis on computer applications in the curriculum to enable students to understand the use of computers in both clinical practice and biomedical research.
- More independent-learning activities have been introduced to deliver core content, and greater emphasis on computer technology for information gathering and searching of the medical literature.
- Significant progress was made in this area through a working collaboration between the school's Erhmann Medical Library and the Division of Academic Computing.
- All basic science courses present material on the Web, including handouts, lecture slides, and specialized learning exercises.
- During the ambulatory care and pediatrics clerkships, students record their patient activities on hand-held computers. This permits the capturing and analysis of each student's clinical experiences.
- Based on the success of this experience the school plans to move to Web-based technology for other courses.

Changes in Assessment

- Assessment of students during the first two years is based on a variety of measures:
    - Examinations. All courses administer written examinations. The formats of the written examinations vary widely and include USMLE-format multiple-choice questions, true–false questions, essays, and free-response items.
    - Exams are given in class, on computers, and as take-home exercises.
    - Examinations have become more integrative as courses within modules have become more interdisciplinary.
    - In general, cumulative final exams are not offered, and USMLE shelf examinations are not widely used.
    - All preclinical courses have small-group sessions and/or laboratories where performance is observed and evaluated. Instructors give feedback to students based on their participation and performances in the small-group sessions.
    - Other means of formative assessment include practice examinations, take-home laboratory exercises, self-assessment problem sets, self-assessment, computer-assisted instruction modules, computer-based modules, and test-item banks for study and self-assessment.
    - Several preclinical courses assign other written work, including papers, essays, projects, and laboratory writeups.
    - Some courses offer opportunities for self-assessment in the form of study aids and as practice for graded exercises. Mechanisms include question banks and computer exercises; the latter are generated internally and also come from external academic and commercial sources.
    - A number of exercises involve students working together in groups, where faculty evaluate their performances.
    - Elements of professional behavior are also part of the formal assessment system in some preclinical courses.
- Clinical curriculum
    - In each clinical clerkship (except ambulatory care), students take a final examination (shelf exam) prepared by the National Board of Medical Examiners (NBME). The NBME grades the exam and students' scores are compared with those of others around the country who have taken the same exam.
    - During the clinical clerkships, faculty preceptors observe students and provide feedback during small-group sessions and on teaching rounds.
    - The ambulatory care clerkship uses an OSCE at the beginning of the clerkship to provide formative feedback to students.
    - Students develop a learning plan with their faculty mentors for their activities in the ambulatory care clerkship based upon their performances on the OSCE.
    - Each student is expected to be observed performing the core skills required in a particular clerkship, e.g., history and physical exam (medicine clerkship), mental status examination (psychiatry clerkship), and procedures appropriate for medical students (e.g., venipuncture).
    - A new objective structured clinical exercise has been introduced this year as part of the funded NYU Macy Initiative in Health Communication; currently, this activity is centered in the third year, but it will be extended throughout the curriculum.
    - In the clinical years, the NBME shelf examinations combined with faculty and house officer assessments of students' clinical performances provide information about their knowledge, skills, and behaviors.

Clinical Experiences

- Students' clinical experiences begin in the first year.
- Over the four years, they spend time in physicians' offices, clinics, and inpatient wards.
- A new four-year course "The Physician, the Patient and Society" will integrate clinical experiences and relevant issues, e.g., ethics, prevention.
- Over the past years, the school has continued to refine its required clinical curriculum for the third and fourth years.
- During the 1996–97 academic year, a four-week rotation in ambulatory care medicine was added to the six clerkships that comprised the core clinical curriculum.
- Students now are required to complete 48 weeks of clinical rotations on the following services by November of the traditional fourth year: medicine (ten weeks), surgery (ten weeks), pediatrics (eight weeks), obstetrics–gynecology (six weeks), psychiatry (six weeks), neurology (four weeks), and ambulatory care medicine (four weeks).
- Prior to graduation, all students must complete a six-week advanced medicine clerkship (subinternship).
- Students rotate on the clinical services of the three major, on-site teaching hospitals of New York University School of Medicine (Bellevue, the VA, and Tisch Hospital), at its affiliated hospitals (North Shore, Lenox Hill, HJD, Gouverneur, NYU Downtown), and at the practice offices of the faculty on campus and the University Health Center at Washington Square.

Curriculum Review Process

- In 1995, the dean appointed a task force with a charge of formally assessing the state of the educational program. Over 100 faculty and students met throughout the 1995–96 academic year.
- In the spring of 1996, their recommendations were endorsed by the Curriculum Committee and approved by the dean.
- The recommendations focused on the preclinical curriculum and addressed three areas: (1) organization of basic science courses into modules, (2) development of a common weekly schedule, and (3) increased emphasis on computer applications in the curriculum.
- In the winter of 1998–99 the current dean appointed the Task Force on Curriculum Policy 2001 to reassess the school's success in accomplishing the objectives of the 1996 task force plan and to make further recommendations.
- Task Force 2001 included members of the Deans' Office, basic and clinical science faculty, and students.
- The group began their work with a series of evening retreats in January and February 1999. These sessions focused on defining unresolved issues and learning about successful educational models at other institutions.
- At an all-day off-campus retreat in March 1999, the task force reviewed its work over the past two months and made detailed recommendations for further change.
- The work of this group and the results of the institutional self-study are guiding the current process of curricular reform.
- The overall goals and specific recommendations are described above.
- The school uses a variety of mechanisms to review the educational program: Through careful analysis of this information by many constituencies, the institution makes every effort to use these indicators to improve the curriculum.
- The Deans' Office and Curriculum Committee rely extensively on students' feedback about the educational program. Current student evaluation activities involve
    - written evaluations completed at the end of the course/clerkship; these include both formal surveys from the deans' office and more detailed departmental surveys
    - active participation on the Curriculum Committee and its subcommittees
    - feedback sessions held regularly by course and module directors with students during ongoing courses
    - collection of data about patient and educational experiences with the use of hand-held computers in the ambulatory care and pediatrics clerkships
- The faculty's input is considered highly important and their perspectives are valued.
- Course/module and clerkship directors communicate frequently with one another and with the deans' office about the curriculum through
    - formally structured committees, e.g., the Curriculum Committee and its standing subcommittees
    - working sessions to plan and monitor courses/modules/clerkships
    - regular meetings, e.g., module directors with the vice dean for medical education and other Deans' Office faculty/staff; quarterly meetings of basic science course directors
- Data reflecting student advancement and graduation rates are closely scrutinized and serve as the subject of regular discussion at the preclinical and clinical examining board meetings. Since there have been no significant problems affecting substantial numbers of students, these have not had a direct influence on curricular change.

- The school uses feedback from residency directors to gain information regarding the performance of our graduates. This feedback is generally quite positive.
- Since 1993, the school has carefully analyzed the responses to the AAMC Matriculation and Graduation Questionnaires to look for additional indicators from students that help evaluate the strength of the educational program.
- Student scores on written exams (other than the USMLE) and performance-based assessments are used primarily by the specific courses, where they play a role in the evaluation of individual students and also as a means to assess the success of the course in adequately conveying key course material. Module and course directors review these outcomes in their internal assessment and planning.
- The school regularly reviews the specialty choices and academic/research careers of graduates, but this information is generally not used for short-term modifications of the curriculum.
- The school continually watches these trends in order to judge success in meeting its central objective—training physician scholars and meeting the expectations of the primary stakeholders, the students.

Future Goals

- Over the next five years, we expect to address the following issues in the educational programs:
  - Enhancing horizontal and vertical integration
  - Promoting active learning and problem solving
  - Developing performance-based assessments that are linked to course objectives
  - Establishing mission-based budgeting
  - Increasing recognition of faculty teaching efforts

University of Rochester School of Medicine and Dentistry

EDWARD M. HUNDERT, MD AND ELAINE F. DANNEFER, PHD

Curriculum Management and Governance Structure

- After a series of major leadership retreats throughout the calendar year 1997, the Medical School Advisory Council (MEDSAC) voted unanimously in December 1997 to completely change the governance structure and management of the medical student education program.
- MEDSAC is the governing body of the school, made up of all chairs and center directors, the head of the faculty council, and senior associate deans, and is chaired by the dean.
- The vote was to create a curriculum steering committee (CSC), to be chaired by the senior associate dean for medical education and to be made up of a small number of committed faculty and educators.
- The size of the CSC since then has varied from seven to nine members. It always includes at least one department chair—each of whom is expected to be there not to represent his or her particular department, but to take an institutional view for the education mission of the school.
- The CSC meets weekly (in addition to regular half- and full-day retreats) and is accountable to MEDSAC via monthly reports on the medical education program.
- The CSC was charged to develop, deliver, assess, and continually improve an entirely new curriculum, to begin with the entering class of 1999—a curriculum whose ambitious goal is to completely integrate the basic and clinical sciences through the four-year curriculum like the two strands of a double helix.
- The "Double Helix Curriculum" was launched in August 1999 with the class of 2003.
- Reporting to the CSC are two larger committees, a committee on years one and two, and a committee on years three and four.
- These committees are more representational, with each course, clerkship, and theme represented to work out issues of implementation and quality control.
- Both committees have both course and clerkship directors, since the "basic science strand" and the "clinical strand" of the Double Helix Curriculum each run through the four years.
- Since the integration of the two strands is the ultimate goal, a decision was made not to have separate basic and clinical committees (which had been more the model of the first and second-year committee and the third and fourth-year committee in the previous curriculum), but to still divide the work into two integrated committees of manageable size.
- Course, clerkship, and theme design teams are responsible for each component of the curriculum (in addition to the Comprehensive Assessment Design Team) and these groups are asked to make regular presentations to the CSC.

Office of Education

- In 1997, URSMD also created a unit called the Offices for Medical Education (OME) under the leadership of a new senior associate dean for medical education, whose responsibilities span undergraduate, graduate, and continuing medical education.
- The OME is divided into several offices, including a central administrative unit, the Curricular Affairs Office, the Office of Educational Resources, the Office of Admissions, the Office of Student Services, the Office of Graduate Medical Education, and the Office of Continuing Professional Education.
- The Division of Medical Humanities is also housed within the OME.
- Each unit has an associate dean or director.
- The Office of Student Services administers financial aid, houses the registrar and the bursar, and oversees student affairs and advising, ethnic and multicultural affairs, and student enrichment programs (student research, international medicine, and community service).
- The Office of Educational Resources provides all logistical support for courses, including laboratories, room scheduling, syllabi, videotaping, etc., plus a new standardized patient program.
- The creation of the Curricular Affairs Office in 1997–98 was a major step for the new curriculum. That office houses faculty educators with responsibility for assessment, curricular development, faculty development, informatics (see below), and educational grants.
- The Longitudinal Ambulatory Clerkship is housed in the Curricular Affairs Office, which is also responsible for tracking the educational contributions of all faculty for the mission-based education budgeting process.

- The medical center's library also plays an important role in the curriculum, and the director of the Miner Library is a full member of the Curricular Affairs Office, so that all informatics support for the curriculum flows out of the library.

Budget to Support Educational Programs

- There are several elements to the budgeting for medical student education.
- The first is the support for all of the offices described above, most of which comes from hard-money tuition dollars, but with an increasing number of education grants as well to support the start-up costs of novel elements of the Double Helix Curriculum.
- The second and largest element is hard-money support to departments for faculty. While historically this money from both the school and the hospital to support faculty was not "cost accounted" to one mission or another, the university has been phasing in a mission-based management system that tracks productivity in all three missions.
- The third element is a defined "education budget," which is given as a separate allocation to departments each year based on the actual teaching of medical and graduate students.
- Funds being channeled into this education budget have formed a higher percentage each year of all departmental budgets, with an ultimate goal of approximately 20% of the hard money that flows to all departments from the dean.

Valuing Teaching

- Both the director of faculty development and the director of curriculum development are very involved in both formal and informal faculty development programs.
- These functions were new when the Curricular Affairs Office was established in academic year 1997–98.
- Workshops and retreats are scheduled as needs are identified, including such examples as workshops for ambulatory preceptors, how to use multimedia in lectures, and the like.
- Routine programs include a required tutor training workshop for every new PBL tutor and a major annual faculty development workshop for the entire faculty each year on some central topic, such as assessment or adult learning. In some courses, videotapes of faculty teaching are routinely provided to faculty with an offer to review them with the director of faculty development.
- The director of curriculum development also works with all course directors on case development and assessment quality.
- The school's philosophy is that the workshops and conferences are a valuable part of the faculty development program, but that the best faculty development takes place in the course of faculty members' working together to create the curriculum.
- Every course, clerkship, and theme design team has a liaison from the Curricular Affairs Office and from the Curriculum Steering Committee to support its curriculum development and continuous improvement efforts.
- Student feedback not only on courses but also on individual faculty is collected through a Web-based system and sent to faculty from the Curricular Affairs Office via the course and clerkship directors.
- The associate dean for curricular affairs, who heads the Curricular Affairs Office, has primary responsibility for assessment. Assessment is also viewed as a central part of faculty development.
- Approximately ten years ago, in conjunction with a major Robert Wood Johnson Foundation grant and alumni fund-raising effort, URSMD established a program called the Dean's Teaching Scholars.
- The endowment now supports 12 faculty in this program at any given time. The term of the award is three years, and each year there are three Dean's Teaching Scholars named, along with one Senior Dean's Teaching Scholar.
- Throughout the three years of the scholarship, these faculty are given special recognition, in addition to extra money that is sent to their departments, including $4,000 per year of extra compensation and $1,000 per year to support travel to educational conferences, education-related software, and the like.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Every course, clerkship, and theme has published learning objectives.
- In addition to the block-by-block assessments of all specific learning objectives, there is a two-week comprehensive assessment at the end of both the second and the third year, to assess these objectives in a more global and integrated way. (The current draft of the global objec-

tives for the medical student program, which are being revised, is available from the author.)

Changes in Pedagogy

- With the launch of the Double Helix Curriculum, the school has moved from a lecture-based curriculum to a hybrid PBL curriculum, with a mix of weekly PBL cases, lectures, labs, conferences, and self-study.
- The strategy to facilitate students' learning is unique among PBL curricula in that students start clinical clerkships during the first two years, so that not only paper PBL cases but the students' own patients drive the learning of basic science.
- Perhaps the clearest symbol of the difference is the new medical education building, which includes state-of-the-art small-group PBL rooms, each of which not only has modern information technology built in, but also includes a fully equipped doctor's office in the same room.
- The curriculum is designed to use both sides of the room in an integrated way throughout all four years.
- There is built-in video technology in every room, so that tapes can easily be made of either side of the room for use in student learning, faculty development, or assessment (the clinical sides of all the rooms are used for OSCEs as well).
- This extensive use of video technology has been a new and very transforming strategy, employed to create reflective practitioners of evidence-based medicine.
- Another major change is the connection of the curriculum to the school's Healthy City initiative, a collaboration with the county health department to improve the health of the people of Rochester.
- This public health perspective permeates the curriculum, from the design of the Mastering Medical Information course to the fourth-year Community Health Improvement Project, a required month of community public health service on one of the Healthy City interventions identified as a real need by the health department.
- The main educational strategy employed to facilitate students' learning is a radical attempt to "shuffle the deck" of the Flexnerian "two-plus-two" paradigm and fully integrate the basic and clinical sciences throughout the four years.
- This strategy is designed to tap into the near-universal experience of fourth-year students, who report that "now that I know a little clinical medicine, I wish I could go back and really learn the basic sciences!" By creating a four-year "clinical strand" and a four-year "basic science strand" of the curriculum, the Double Helix Curriculum is an effort to instill that same drive for students to learn the basic sciences throughout the four years, and, by habit, throughout the graduates' medi al careers.
- The strategy may be described briefly as follows:
    - After an intensive, month-long introduction to information management, students learn anatomy, histology, and physiology through the rest of the first semester as they learn history taking and physical examination at the same time, system by system. This means that when students are dissecting the knee, looking at cartilage under the microscope, and learning musculoskeletal physiology, that is also when they learn to examine the knee. When they dissect the heart, look at myocardium under the microscope, and learn cardiac physiology, that is also when they learn to examine the heart. This completely changes the context of learning, so that by the end of the first semester, students can competently take a history and do a physical exam in the context of a check-up of a normal, healthy patient.
    - Starting in the second semester of the first year, the students under the new curriculum are in a pedagogic place medical students have not been in before. They are ready to start a longitudinal clerkship that will be more than the kind of shadowing of experiences most students have in preclinical "doctoring" courses, and through which they will learn to treat patients while they are going through their courses in the basic science strand of the curriculum.
    - Finally, by moving approximately four months of the former block ambulatory care clerkships into the first half of the curriculum's clinical strand (years one and two), time is thus freed up during years three and four for approximately three months of advanced basic science work plus a month for the Community Health Improvement Project. This includes three two-week advanced basic science blocks in the third year and one four-week advanced basic science block in the fourth year (during which no inpatient clerkships are scheduled).

Application of Computer Technology

- There are many networked computers in all settings, so students are not required to purchase computers (although the specifications for a computer compatible with the systems are sent to all admitted students in case they wish to buy one).
- The Double Helix Curriculum opens with four full weeks of the Mastering Medical Information course (actually a six-week course that also makes up the last two weeks of the first year). Before any of the biological sciences be-

gin, students have a full month of training in how to search the literature, how to assess the studies they find (clinical trial design, biostatistics), how to decide the appropriate level to search (when to use a textbook and when to use the Web), and all the epidemiology and other information sciences basic to the practice of evidence-based medicine.

- The assessment of this course includes novel approaches to assess the *efficiency* of the students' searching strategies and the quality of their interpretations of the literature.
- The entire curriculum is run through a Web-based system called TopClass, and students all routinely use information technology in both the basic and the clinical strands of the curriculum.

Curriculum Review Process

- At the end of each component of the curriculum, a formal assessment is done, including a Web-based student evaluation (which is required of all students to receive credit for the course), feedback from all faculty, a focus group of students and faculty, and review of student performance outcomes.
- This information is summarized in a report prepared by the Curricular Affairs Office and sent to the course design team to make a plan for the next year.
- The elements of that plan then become the first page of the final assessment report, which is given to all students, course faculty, and all department chairs.
- For more global reviews, the Curriculum Steering Committee conducts regular reviews of all components of the educational program, and the two-day annual education conference focuses on major program assessment.
- The curricular reform was launched in 1997 for implementation with the entering class in 1999. From the dean to the senior vice president for health affairs to the president of the university, a major commitment of resources to build a new medical education building for the Double Helix Curriculum to the increase the support for medical education has been crucial to the success of that curriculum.
- In addition to the capital requirements for the building and all the computer and audiovisual infrastructure for novel educational spaces, support included ongoing budgetary commitments to curricular development and renewal.
- A "resource" perhaps even bigger than administrative financial and priority support has been the commitment of the faculty and student body.
- The longstanding dedication of the faculty to the medical student education mission has never been demonstrated more clearly than in this curricular reform, coming as it has during a time of simultaneous building of the research and clinical missions. Indeed, the biggest barrier to overcome has been the conflicting demands created by a research-intensive academic medical center trying to excel in all three missions. With increasing demands on the faculty for clinical productivity and research grants, the enthusiasm with which the Double Helix Curriculum has been developed and launched stands as a real example of what a faculty can do if it is committed to its students.
- As mentioned above, the creation of exciting new space in which to teach and learn and the building of the Offices for Curricular Affairs and Educational Resources (which take a service-oriented view of the teaching faculty as their valued clients) and the involvement of the Miner Library (with that same orientation) have also been central to the success of the enterprise.
- As stated earlier, the Double Helix Curriculum is being phased in with the class of 2003.
- The first year has already been fully implemented and the second year is very far into the detailed development phase at this time (hour-by-hour schedules nearly complete, PBL cases being finished, tutor training under way).
- The design of the third and fourth years is also finalized, but many of the details of the advanced basic science curriculum are still being developed.
- The entire faculty and student body are deeply engaged in this continuing development (and continuous improvement of the parts already implemented).

Future Goals

- The major issues in the next five years surround the continued implementation of the Double Helix Curriculum and the assessment of its success in meeting its ambitious goals.

State University of New York (SUNY) Downstate College of Medicine

JEANETTE MLADENOVIC, MD

Curriculum Management and Governance Structure

- Prior to 1997, the curriculum was under the auspices of the part-time associate dean for education and an elected curriculum committee.
- In 1997, under the leadership of a new dean, the college began to pursue total curricular reform.
- A "new curriculum steering committee" and several subcommittees were created to define the objectives of a new curriculum, its format, and methods of implementation and evaluation.
- The first year of the new curriculum was implemented for the entering class of 1998.
- The new curriculum format is integrated across departments and disciplines throughout the four years.
- Governance of the curriculum is under a full-time senior associate dean, with new assistant/associate deans established for basic science and clinical science.
- The membership and function of the curriculum committee are being re-evaluated and will probably be enhanced to provide greater faculty oversight of the curriculum.

Office of Education

- Education remains a primary function of the dean's office.
- The dean's office staff has expanded in the past two years to support the departmental and faculty commitments to education.
- The dean's office has been particularly active in the development of community-physician preceptor sites and hospital affiliations.
- An office of institutional evaluation has been added and is active in faculty development, test writing, and faculty and course evaluation.

Budget to Support Educational Programs

- The College of Medicine provides funds directly to support education.
- Funds are allocated
    - to develop and support several non-departmental courses
    - for personnel within the educational offices
    - for computer and audiovisual support
    - for education personnel in departments
- Mission-based allocation of state dollars is used in determining faculty salary support for educational activities.

Valuing Teaching

- Clinical faculty receive state money to support their activities as course directors, which relieves their clinical time commitments.
- State monies support basic science faculty, and involvement as course directors is considered integral to their academic mission.
- Teaching activity is considered in academic promotions.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- These were addressed during the curriculum redesign but are being more explicitly delineated now.

Changes in Pedagogy

- Case-based, small-group learning is introduced beginning in the first year (ten students per group).
- Lecture hours have been reduced approximately 50%.
- Cases are developed by an interdisciplinary group for each course and led by a team of a basic scientist and a clinician.
- Students now begin their clinical experiences in the first year.
- The Doctoring course (first and second years and extending to year three) consists of small groups, required

research/essay papers that cover individual patients, and community, public health policy, or practice issues in the context of society.

- Breast and pelvic examinations are taught by trained women's health associates; heart sounds and CPR are taught using models.

Application of Computer Technology

- Students have desktop computer access at their student carrels in the education building (one computer/12 students).
- Computers allow access to e-mail, bulleting boards within the school, and course materials on the Web.
- Approximately 75% of courses in the first two years use the Web for some learning activity, including access to faculty and their notes, pretests, tutorials, and visual images of slides.
- Over the next year, more course work and lecture notes, as well as student/course evaluations, will be Web-based.
- Student dormitories are being networked currently.
- The Web is being used increasingly in clinical clerkships.
- Informatics and evidence-based medicine are being taught in year two and will be integrated throughout years three and four.

Changes in Assessment

- Approximately 25% of all exams in the first and second years consist of patient-oriented stems, requiring integrative thinking to answer.
- The school participates in a consortium of schools to evaluate students' performances using standardized patients at the Morchand Center. Students are required to pass an assessment of eight patients prior to entering their third-year clerkships.
- The Morchand Center facilities will be used to assess student communication skills in the first year.
- The primary care clerkships require faculty observation of each student performing a history and physical examination prior to completion of the clerkship.
- Oral examinations are an integral part of the surgery and medicine clerkships.
- Students take an OSCE in the first-year Doctoring course.

Clinical Experiences

- Third- and fourth-year inpatient rotations occur in a very busy public hospital environment.
- All students rotate through several university-affiliated hospitals that provide experiences in other socioeconomic and cultural settings.
- In the first year, students spend one half-day a week with a clinical preceptor, most in private physicians' offices.
- The clinical preceptor experience is continued in the second year and is integrated with a physical examination course.
- An interdisciplinary primary care requirement in the clinical years allows students the opportunity to care for patients in an outpatient continuity setting.

Curriculum Review Process

- The curriculum is undergoing a "rolling reform process" begun two years ago.
- Themes and goals of the renewal effort include
  - integration of basic and clinical sciences throughout all four years
  - transition to small-group learning to foster problem solving, lifelong learning, and team participation
  - fostering of communication skills, cultural sensitivity, prevention and public health awareness, and the practice of evidence-based medicine
  - heightened attention to professionalism
- Major challenges have included the change of courses from departmental to interdisciplinary courses; the need to use non-content experts in teaching; the large numbers of faculty required to increase their teaching time; and the limited availability of clinical teaching sites.
- There is a study to compare students' performances before and after the new curriculum in the first years.
- To date, students have evaluated the new curriculum positively.
- The outcome measures for the new curriculum include attainment of physician competencies at graduation, performances on standardized exams, the satisfaction of students and training programs with postgraduate performances; and attainment of professional and institutional career goals by students.
- Continuous curriculum review will occur on a yearly basis.

Future Challenges

- Maintaining adequate enthusiasm and faculty support for case-based, small-group learning (20 groups are needed for each class, 75 contact hours for each per year)

- Identifying enough ambulatory sites of equivalent quality and travel time to accommodate students
- Shortages of patients in certain disciplines for student contact due to hospital closures and the increase in faculty and physician productivity required
- Increasing competition by offshore and osteopathic students for training sites in community hospitals

State University of New York at Stony Brook Health Sciences Center

PETER C. WILLIAMS, JD, PHD

Curriculum Management and Governance Structure (See Figure 1)

Office of Education

- The Office of Educational Support was established in 1998.
- The office is responsible for enhancing students' academic skills.
- The office has played a major role in the implementation of the MedCareers program.

Budget to Support Educational Programs

- There is a discrete budget, primarily for the multidisciplinary programs, with lesser direct support for departmentally based educational programs.
- The budget is funded from the dean's office.

Valuing Teaching

- Both student awards and faculty-generated awards (with monetary benefits) are given each year to faculty, based on outstanding teaching contributions.

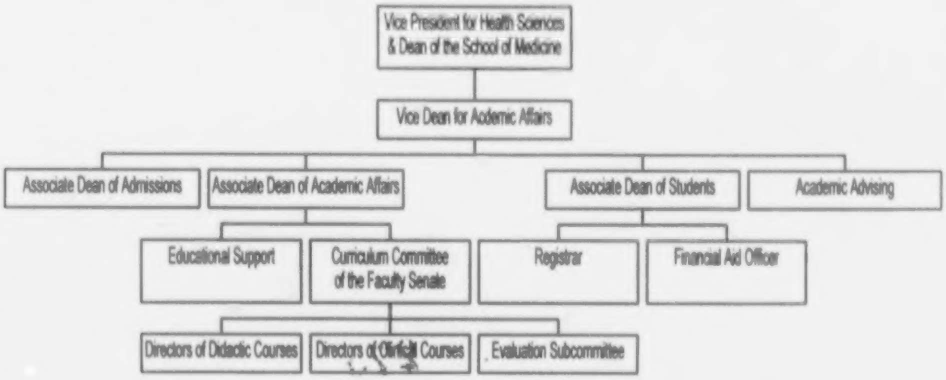
CURRICULUM RENEWAL PROCESS

Learning Outcomes

During the past decade, the general goals of curricular renewal have been:

- Ensure that all students become fully grounded in the biomedical sciences basic to the future practice of medicine and fully acquainted with the opportunities and expectations for a career in research.
- Ensure that all students become fully acquainted with the nature of the gratification inherent in, and the multiple career opportunities available, in the generalist fields.
- Ensure that all students, whatever their future career goals, graduate with a strong foundation in the knowledge, skills, attitudes, and behaviors embraced by generalism.
- Develop the faculty and programmatic resources necessary to mount quality educational experiences in the ambulatory arena, particularly in the community-based settings.
- Ensure that clinical decision theory and the principles of cost-effective patient care (e.g., the use of outcomes date to inform clinical decisions, the adherence to practice guidelines, the parsimonious use of clinical resources) occupy appropriate prominence in the curriculum.
- Enhance significantly the attention paid to patient education, disease prevention, health promotion, and clinical epidemiology.

FIGURE 1: Governance of Academic Programs


Vice President for Health Sciences & Dean of the School of Medicine
Vice Dean for Acdemic Affairs
Associate Dean of Admissions
Associate Dean of Academic Affairs
Associate Dean of Students
Academic Advising
Educational Support
Curriculum Committee of the Faculty Senate
Registrar
Financial Aid Officer
Directors of Didactic Courses
Directors of Clinical Courses
Evaluation Subcommittee

- Reinforce efforts to educate students about the many crucial interfaces between medicine and society.
- Incorporate curricular elements designed explicitly to develop skills in critical thinking, rational decision making, and communication.
- Provide all students with opportunities to learn about the unique capabilities and skills of other health professions and to work cooperatively with integrated teams of health care professionals in the actual care of patients.
- Structural goals are
  - to adjust the number of contact hours to be devoted to the lecture format and to alternative, small-group sessions
  - to increase the portion of the curriculum organized in adherence to the principles of problem-based learning
  - to increase the proportion of examinations using essays, short answers, and problem solving rather than multiple-choice questions and regurgitation
  - to increase the use of formal methods for assessing clinical skills (e.g., standardized patients, organized structural clinical examinations)
  - to increase the use of clinical correlation exercises and examples of clinical relevance in all basic science courses
  - to increase the use of informatics and other self-directed learning techniques

Changes in Pedagogy

- Before curriculum renewal, the curriculum was a traditional, lecture-based program, organized by departments, with as many as seven contact hours per day.
- There have been modest increases in small-group learning experiences and in the use of computer-assisted instruction.
- There has been an increase in the use of standardized patients in the second year Introduction to Clinical Medicine course.

Application of Computer Technology

- All students are required to have computers.
- Computer technology is used increasingly in the delivery of the curriculum.
- Course schedules, announcements, syllabi, course evaluations, and grade distribution are all on the Web.
- A learning center with more than 100 computer stations has been developed in the library and a budget has been created for the purchase of software programs.
- Modest improvements have been made in hiring more staff to support the program.

Changes in Assessment

- There has been a significant increase in the use of standardized patients in the fourth-year assessment of student competencies.

Clinical Experiences

- In the past three years, the structure of clinical teaching has changed.
- Students have clinical experiences in a range of hospitals, including the University Hospital, the Veteran's Hospital, a private hospital, and a county hospital.
- A concerted effort has been made to increase ambulatory experiences, and in the current clerkship year approximately 40% of training occurs in the non-ward situation.

Curriculum Review Process

- An ongoing review process was adopted two years ago.
- Each course is reviewed on a three-year cycle.
- An MD and a non-MD are paired to form a review team that determines whether or not a particular course is meeting its stated objectives.
- The school is beginning to create a database of all subjects taught in order to reduce redundancies and find and fill educational lacunae.
- The curriculum is under constant review, with particular attention paid to performances on standardized examinations and standardized patient examinations, and subjective evaluations by faculty, students, and residency program directors.

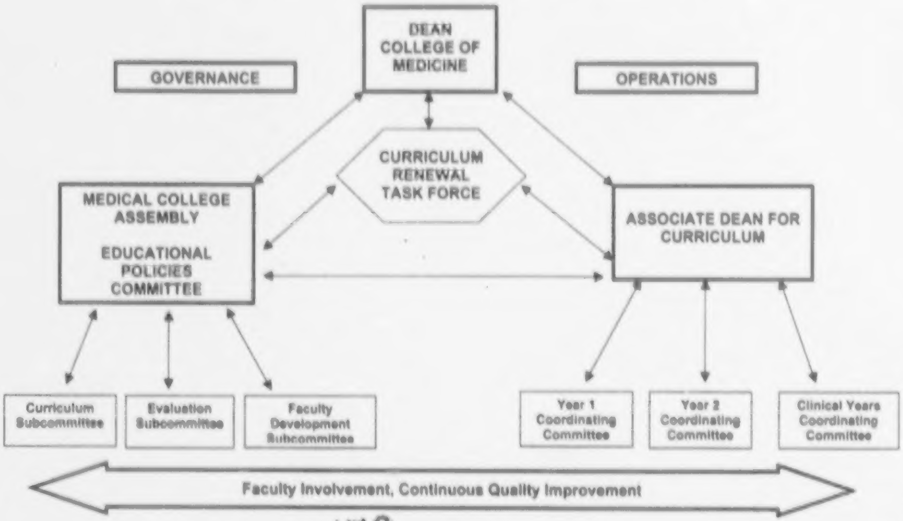
SUNY Upstate Medical University (formerly SUNY Health Science Center at Syracuse) College of Medicine

LYNN CLEARY, MD

Curriculum Management and Governance Structure (See Figure 1)

- Curriculum of the College of Medicine is governed by the Educational Policies Committee (EPC), a standing committee of the Medical College Assembly, which is composed of all members of the academic staff of the college.
- The EPC reports semiannually to the Medical College Assembly, where any major change in the curriculum must be approved. Each department chairperson in the College of Medicine appoints one representative to the EPC, and the dean of the College of Medicine appoints six members. It is a fairly large committee, which meets monthly.
- Administration and oversight of courses is within discipline-based departments.
- The Curriculum Renewal Task Force, comprised of eight faculty involved in the two prior plans, has met weekly since late 1999. It has achieved a general format for a renewed curriculum. The new format preserves departmental control over courses and establishes a discipline-based introduction to the organ-system phase. The organ systems will be taught in two passes, the first presenting normal structure and function, the second teaching pathology, pathophysiology, and pharmacology.
- This general design has been handed over to the newly formed curriculum coordinating committees. These oversight committees—Year 1, Year 2, and Clinical Years Committee—are coordinated through the associate dean for curriculum.
- Members of each committee include course directors and teaching faculty from all years of the curriculum, to provide oversight between years as well as within a year. The initial work of these committees has been to develop the nuts and bolts of an integrated, consolidated curriculum.
- Course directors and teaching faculty who did not previously have enough dialog are working together to decide the appropriate amount of redundancy, fill in gaps, and eliminate the unnecessary.
- The task force hopes to see a renewed curriculum in place for students entering in 2001. The outcome will be a far more integrated curriculum content.

FIGURE 1: Curriculum Governance and Management


DEAN COLLEGE OF MEDICINE
GOVERNANCE
OPERATIONS
CURRICULUM RENEWAL TASK FORCE
MEDICAL COLLEGE ASSEMBLY
EDUCATIONAL POLICIES COMMITTEE
ASSOCIATE DEAN FOR CURRICULUM
Curriculum Subcommittee
Evaluation Subcommittee
Faculty Development Subcommittee
Year 1 Coordinating Committee
Year 2 Coordinating Committee
Clinical Years Coordinating Committee
Faculty Involvement, Continuous Quality Improvement

BEST COPY AVAILABLE

- Departmental responsibility for courses will be retained, with some courses enjoying the shared sponsorship of two or more departments.

Office of Education

- There is currently not a separate office of education to support the educational program, faculty, and administration.
- Most curricular support currently comes from individual departments and through the Curriculum Office.
- The Curriculum Office provides support and assistance for a limited amount of testing, course planning, and course support, but it is a small office and could not meet the large needs of the entire curriculum.
- As curricular renewal conversations continue, it is clear that an office of education would be useful in supporting the overall process of continuous renewal, including evaluation and implementation of change.
- It is likely that expanded resources to support a standardized-patient program for teaching and for clinical evaluation will be needed.

Budget to Support Educational Programs

- The monetary support of the program follows a dispersed model. As part of the State University of New York, the College of Medicine receives some state money to support the educational process. This is distributed through the College of Medicine along departmental faculty lines.
- There is no separate and discrete budget identified to support the educational program, which relies significantly on the budgets of individual departments and the dean's fund for its sustenance. Departments with significant resources are more able than others to provide support to their courses.

Valuing Teaching

- Departmentally designated faculty direct each course, clerkship, and curricular theme.
- These core course, clerkship, and theme directors form the basis of the faculty whose primary responsibility is the medical student education program.
- These groups meet on a regular basis and now form the membership of the Curriculum Coordinating Committees (see above).
- Teaching responsibilities and effectiveness are important considerations in the promotion process, and a number of teaching awards are given every year.

CURRICULUM RENEWAL PROCESS

- In 1995, the EPC undertook the lengthy process of determining curricular goals and graduation competencies. These goals and competencies set the stage for further review of the curriculum.
- In 1998, the current dean of the college initiated dialog for curricular renewal. He re-established the position of associate dean for curriculum and charged her to initiate this effort.

Learning Outcomes

- A list of the curricular goals is available from the author.
- With the Educational Policies Committee (EPC), the associate dean for curriculum developed standing subcommittees responsible for curriculum, evaluation, and faculty development. The Curriculum Subcommittee defined general goals of curriculum. There was broad-based consensus regarding the general goals, which include:
  - integration of curricular content between and among disciplines
  - emphasis on a teaching/learning format that promotes independent and self-directed learning
  - reduction of structured contact time, especially didactic lectures, to provide students more time for self-directed study
  - early introduction of clinical experience
  - provision of a structure to ensure continuous quality improvement in the curriculum

Over the next year, the Curriculum Subcommittee of the EPC developed a proposal for a new curriculum, which was organ-based. It proposed that following a brief discipline-based introductory phase, all of the basic science about each organ system would be learned in a single integrated course. The administrative structure for this proposal was to be interdisciplinary.

The proposal was presented to faculty, department chairs, and students and stimulated much discussion and a counterproposal. A number of basic science faculty and their chairs were concerned about the radical change in administrative responsibility for courses. A grassroots "R2K Committee" (for "Renewal 2000") formed, composed of faculty of the five basic science departments and the Pathology Department. Working with their chairs, they developed an alternative proposal for curriculum renewal that preserved departmental responsibility for courses but improved the integration of curricular content and provided for curriculum coordinating and oversight committees. These committees would provide the interdisciplinary structure to maintain dialog among course directors regarding curriculum content and format, and the mechanism for continued quality improvement of the curriculum.

During a retreat in October 1999, faculty members involved in both proposals, course and clerkship directors from all required courses, and key administrators met to review the two proposals. Consensus was easily reaffirmed regarding the goals of curricular renewal, but the group split fairly evenly over which proposal best served those goals. The dean charged a combined Curriculum Renewal Task Force to work toward a single new proposal that would capture the best elements of the two plans. The work of the task force is reviewed in the first section of this article.

Changes in Pedagogy

- The curriculum is a traditional, discipline-based format that covers normal human structure and function in year one, disease processes and pharmacology in year two, the traditional clinical clerkships, and a flexible elective year.
- Curricular renewal efforts should result in significant horizontal and vertical integration of content, and consolidation of contact hours.
- Over the past two decades, the teaching format of basic sciences has gradually shifted from didactic lectures and laboratories toward small-group teaching and learning.
- Laboratory time has been reduced by approximately 50%. During the same period, three new courses (medicine and society, cell and molecular biology, and a family medicine clerkship) were added to the curriculum.
- The overall curriculum still relies heavily on the lecture format, and contact time is high.
- There has been increased use of clinical case material to introduce and reinforce basic science material.
- Greater emphasis has been placed on the process of learning and discovery, in both new and longstanding courses.
- The humanities, the scientific process, diversity, professional development, prevention, ethics, and other areas have received greater emphasis.
- Some courses and clerkships now use interactive, case-based, small- and large-group teaching.

Application of Computer Technology

- Upstate Medical University is fortunate to have state-of-the-art computer technology resources, including an ATM fiber-based backbone, numerous networked public PCs, and networking support sponsored by the institution.
- There has been no need for students to own their own computers, since terminals and network access are so widely available throughout the institution and in the dormitories.
- Courses have increasingly required computer use as part of the learning and evaluation process.

Changes in Assessment

- Assessment methods have become broad and rich.
- Assessment tools include
  - traditional multiple-choice question tests
  - problem-solving written tests
  - personal essays
  - quality of student presentations
  - computer-based assessments
  - standardized patient evaluations in the Introduction to Clinical Medicine course and several clerkships
  - faculty observation of clinical performance.
  - participation in small-group activity
- An objective structured clinical examination (OSCE) has been operational at the end of the third year in Binghamton for two years, and it will be piloted at the Syracuse campus this year.

Clinical Experiences

- A longitudinal Practice of Medicine course, which is under development, will provide integrated clinical material from the beginning of year one. Several curricular themes will be woven into the curriculum (e.g., prevention and population medicine, which is already successfully integrated, bioethics, evidence-based medicine, end-of-life care, and spirituality).
- Concurrent clinical electives and many extracurricular clinical opportunities are available for students in their basic science years. Forty first- and second-year students

per year participate in the MIRACLE elective, where they are paired with a pregnant woman, follow the pregnancy, attend the birth, and follow the family for the first year of the child's life.

- Another option is a new elective entitled The Meaning of Illness, where students are paired with pastoral care providers and make rounds on hospitalized patients dealing with acute and chronic illnesses.
- The Introduction to Clinical Medicine course provides all second-year students with a balanced experience in hospital, outpatient, and long-term care settings to learn basics of the history and physical exam.
- Third-year students spend the year at either the Syracuse or the Binghamton campus and rotate through traditional discipline-based clerkships.
- A broad spectrum of training settings is available, including public, private, and Veterans' hospitals, private offices, county health clinics, health maintenance organizations, and long-term care settings.
- All primary care clerkships now rotate the students through ambulatory settings for 30–50% of their experience.
- A longitudinal primary care experience is part of the third year in Binghamton.

Curriculum Review Process

- The EPC Evaluation Subcommittee, formed just two years ago, has now established a policy and a procedure for systematic evaluation of components of the curriculum. This has resulted in widespread recruitment of faculty involvement in in-depth course reviews and improved communication between clerkships on the two clinical campuses.
- A feedback loop to the Curriculum Coordinating Committees and vice versa is now in place to provide continuous quality improvement.
- The systematic evaluation will continue to highlight the need for an office of education to help course directors and faculty accomplish the necessary changes and to maintain a curriculum of high quality.
- The clinical evaluation process could use the support of a larger standardized-patient program.
- The development and nurturance of a community-based faculty have been a departmental responsibility to date, and may require some institutional support.
- Evaluation of the changes will include an assessment of how well the curriculum has accomplished the original goals of renewal, which should be fairly straightforward (see goals above).
- Evaluation will include student and faculty inputs and traditional outcome measures (residency choices and Match results, standardized test scores).
- Evaluation will be more subtle and continuous, facilitated by dialog at Curriculum Coordinating Committee meetings, where faculty ask hard questions of each other and struggle to find answers, contributing to a curriculum that is continuing to evolve and adapt to the needs of current students and future physicians.

Duke University School of Medicine

RUSSEL E. KAUFMAN, MD, AND EMIL R. PETRUSA, PHD

Curriculum Management and Governance Structure

- There has been significant change in the past ten years.
- The offices of the chancellor and the dean were occupied by the same persons for most of the 1990s.
  - Medical education was under the direction of a dean for medical education.
  - The dean for medical education worked with the dean to develop the philosophy of the school; the curriculum committee functioned to develop courses.
  - The curriculum was organized primarily around departments.
- In 1999, the dean created a new position of vice dean for education.
  - The vice dean was given responsibility for medical student, graduate medical, graduate, continuing medical, and allied health sciences education and the medical library.
  - The vice dean was given responsibility for developing the philosophy and integrating the operations of all education in the school of medicine.

Office of Education

- The medical school is divided into divisions that include the Central Teaching Laboratory (CTL), established in 1968 for curricular support; and the Office of Medical Education Research and Development (OMERD), established in 1994.
- CTL provides support for
  - setting up laboratory exercises
  - administering course evaluations
  - scoring tests
  - supporting educational software
- OMERD is responsible for
  - developing program and learner evaluation
  - holding workshops on test-item writing and test development
  - reinforcing educational models and theory as frameworks on which to build courses and learning experiences
  - recruiting, training, and monitoring standardized patients for teaching and assessment
  - collaborating with other faculty to compete for external funding
  - working with faculty interested in scholarship in medical education

Budget to Support Educational Programs

- Many discrete budgets fund part of medical student education.
- In 1997, the dean for medical education worked with department chairs, course directors, and medical school financial officers to establish a formula for the allocation of educational funds to basic and clinical science departments and specified the portion of a department's budget that is to support medical student education. These budgets are controlled through the dean's office.
- Other resources in departmental budgets support medical student education by purchasing faculty release time, but are not captured in a formal process.
- Each department receives a formal allocation to support medical student education, for which it is accountable.
- Resources to support medical student education come from the clinical practice plan, the hospital, the university, foundation support, and tuition.

Valuing Teaching

- Faculty members who devote significant portions of their time to medical student education receive salary support from their departments, usually the medical school allocation.
- Medical student teaching is considered in promotion and tenure processes for all faculty.
- A tenure track has been developed for clinician educators.
- Students recognize faculty members with faculty teaching awards.
- Guidelines for promotion and tenure dossiers require evidence of teaching quality from all faculty.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In 1994 medical school faculty accepted a set of core competencies that students must accomplish prior to graduation from medical school. These are under review (see Curriculum Review section).
- Student promotion is based primarily on successful completion of individual courses.
- Committees of first- and second-year course directors review each student's overall academic performance to determine the student's preparedness for the next year's work.

Changes in Pedagogy

- Students in preclinical years are taught using case-based instruction, standardized patients, small-group learning, Web-based information, and lectures.
- There has been a significant decrease in lectures over the past decade.

Application of Computer Technology

- All students are required to have laptop computers with certain specifications, which they own or they lease from the medical school.
- Faculty support for the design and creation of computer and Web-based educational materials is available from the CTL and Educational Media Services.
- Individual course directors integrate electronic teaching support into course work.
- Databases and common resources are either made available on-line or installed on each computer.
- A new (1998) electronic classroom with individual Internet and intranet connections serves as the main teaching theater for preclinical classes.
- Course evaluation forms are posted on the intranet.
- Official notices are sent via e-mail and some course tests are conducted over the intranet.

Changes in Assessment

- Clinical skills of first-year, pre-clerkship, and post-clerkship students are evaluated using standardized patients.
- Assessment methods include
  - standardized patients
  - computers
  - faculty observations
  - the OSCE
  - NBME shelf exams (used in some basic science courses and clerkships)
  - computer-based testing (under development for several courses)
- Since 1993, a multi-station clinical performance examination has been used for comprehensive assessment of students following their clerkship year.
- One clerkship uses an oral examination.
- One clerkship requires a written project on a population health issue.
- All clerkships recently began implementing a common evaluation of students' professionalism.
- Plans are to develop an assessment strategy to determine how well students have mastered curriculum objectives in medical informatics.

Clinical Experiences

- Students participate in clinical experiences in both inpatient and ambulatory settings at Duke University Medical Center, the Durham VA medical center, and the clinics associated with the Duke Health System.
- Ambulatory experiences have been available since 1997 at AHEC sites, private practice sites, and international sites.
- Students have the opportunity to experience clinical practice in developing countries or underserved areas in the United States.

Curriculum Review Process

- The curriculum has undergone two major reviews, with major and more modest changes occurring in the past ten years.
- The third major review was begun in fall of 1999 with the goal of examining all components of the curriculum and teaching approaches—to culminate in a comprehensive report.
- A curriculum organizing and review committee has been established to use the comprehensive report; innovations from the medical education literature and collegial contacts are consulted by the committee.

- The process will lead to modifications in both content and pedagogy over the next three years.
- The current review utilized faculty and students to review the effectiveness of current teaching approaches.
- The committee is developing a plan for central control of the curriculum, which may result in an organ-based curriculum.
- The major issues are to utilize resources more effectively and to secure financial support for clinician–student contact time.

The Brody School of Medicine at East Carolina University

ANN JOBE, MD

Curriculum Management (See Figure 1)

Curriculum Governance Structure

- Prior to 1990 there was one curriculum committee, composed of chairs of the individual departments.
- In 1990 the executive curriculum committee and the M–1, M–2, M–3, and M–4 curriculum committees created principles for curriculum management:
  - Broad input from all constituencies will be encouraged.
  - Open communication is essential.
  - Curriculum management is a shared responsibility of faculty, students, and administration.
  - Coordination of pieces of the curriculum to achieve an integrated whole is important.
  - Curriculum management is a dynamic process.

Office of Medical Education

- Established when the medical school was started, but in the 1980s members of the Office were assigned to individual departments
- 1992—centralized Office of Medical Education reestablished

Budget to Support Educational Programs

- Currently no discrete budget to support educational programs
- Developing one now in coordination with the Mission-Based Management Project

Valuing Teaching

- Identification of faculty with primary responsibility for teaching is a component of the Mission-Based Management project.
- Faculty recognition now is through teaching awards.
  - Students select and nominate teachers for awards.
  - Teaching awards are also determined by a peer selection and nomination process.

CURRICULUM CHANGE PROCESS

Learning Outcomes

- Faculty endorsed the medical school's objectives developed by the Executive Curriculum Committee based on the AAMC's Medical School Objectives Project. These objectives state that graduates of ECU School of Medicine must be
  - professional
  - knowledgeable
  - skillful
  - good citizens
- Measurable outcomes and objectives are under development for each component of the attributes.

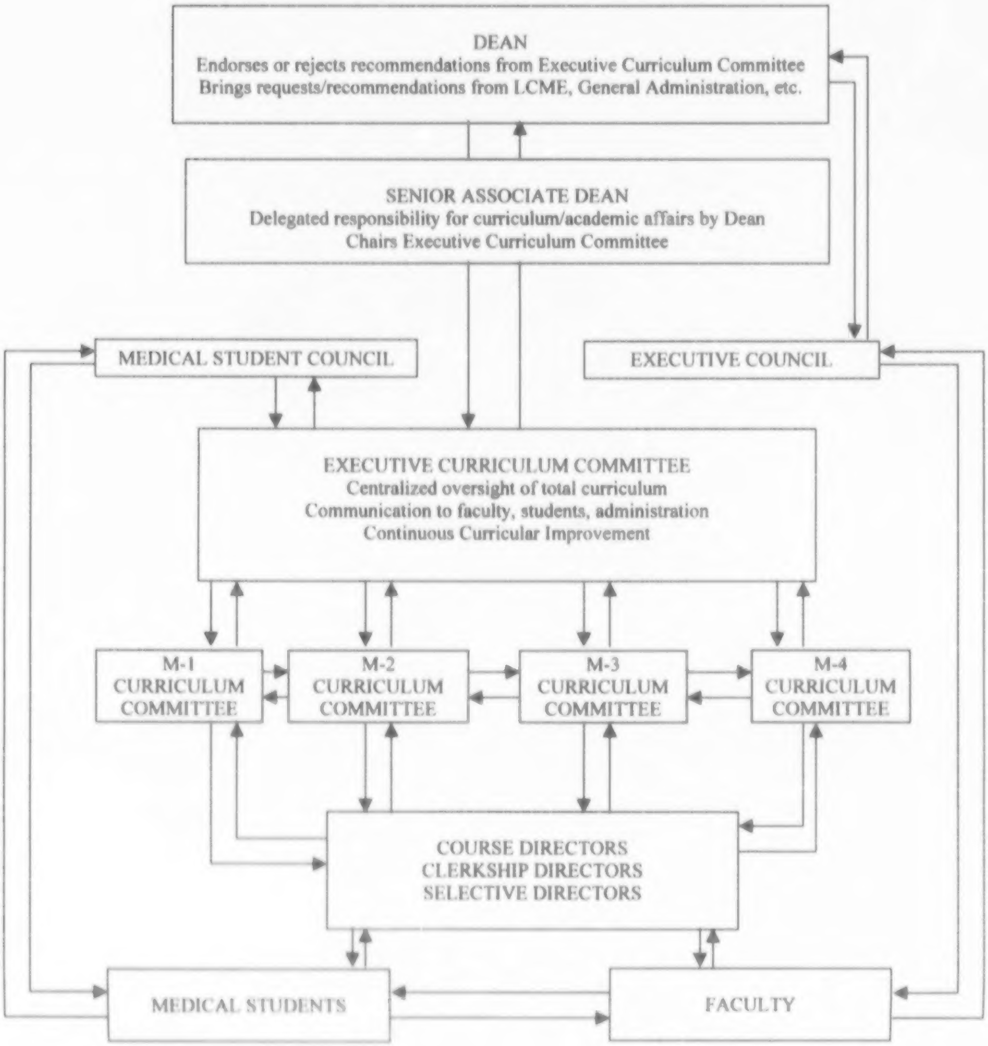
Changes in Pedagogy

- During 1990–1996 there was a trend toward small-group and case-based teaching experiences.
- Since 1996, there has been a slight decrease in the number of hours of small-group learning.
- There are difficulties in assigning clinical faculty to longitudinal and small-group teaching experiences because of increased clinical demands.
- The majority of courses include clinical-correlation cases to provide a context for the material covered.
- Standardized patients and "standardized family" are used for teaching and assessment.

Application of Computer Technology

- Students are not required to have computers
- Computers are applied in individual courses

FIGURE 1: Curriculum Management Strategies


DEAN
Endorses or rejects recommendations from Executive Curriculum Committee
Brings requests/recommendations from LCME, General Administration, etc.
SENIOR ASSOCIATE DEAN
Delegated responsibility for curriculum/academic affairs by Dean
Chairs Executive Curriculum Committee
MEDICAL STUDENT COUNCIL
EXECUTIVE COUNCIL
EXECUTIVE CURRICULUM COMMITTEE
Centralized oversight of total curriculum
Communication to faculty, students, administration
Continuous Curricular Improvement
M-1 CURRICULUM COMMITTEE
M-2 CURRICULUM COMMITTEE
M-3 CURRICULUM COMMITTEE
M-4 CURRICULUM COMMITTEE
COURSE DIRECTORS
CLERKSHIP DIRECTORS
SELECTIVE DIRECTORS
MEDICAL STUDENTS
FACULTY

- There is no overall integration of computer technology across curriculum

Changes in Assessment

- There is increased emphasis on standardized patient assessments in all four years.
- Plans are under way to develop an internal computer-based comprehensive basic science examination; the exam will serve as formative evaluation for students and faculty teaching each component.

Clinical Experiences

- Students participate in preceptorships during the first and second years.
- Students spend three to five days in communities with primary care preceptors.

- Students participate in inpatient settings in both a tertiary care hospital and smaller community hospitals.
- Students participate in the outpatient setting both at the medical school and in the community.
- There are various experiences at community-based health clinics and mental health clinics.

Curriculum Renewal

- The school is beginning the process of renewal of the curriculum.
- The objectives developed will serve as a foundation for an analysis of current strengths, weaknesses, and gaps.
- Goals include
    - increased integration of basic and clinical sciences
    - emphasis on self-directed learning
    - development of coordinated comprehensive assessment approach including formative and summative evaluation
    - improvement of curriculum evaluation system to enhance accountability
    - incorporating information technology
- Curriculum management strategies outline a process for ongoing review of the educational program.
- Not all strategies and processes have been implemented yet.
- The focus for the next few years will be on implementing a quality-improvement–based approach to curriculum management.

University of North Carolina at Chapel Hill School of Medicine

CHERYL F. MCCARTNEY, MD, CAROL P. TRESOLINI, PHD, PAUL B. FAREL, PHD,
AND GEORGETTE A. DENT, MD

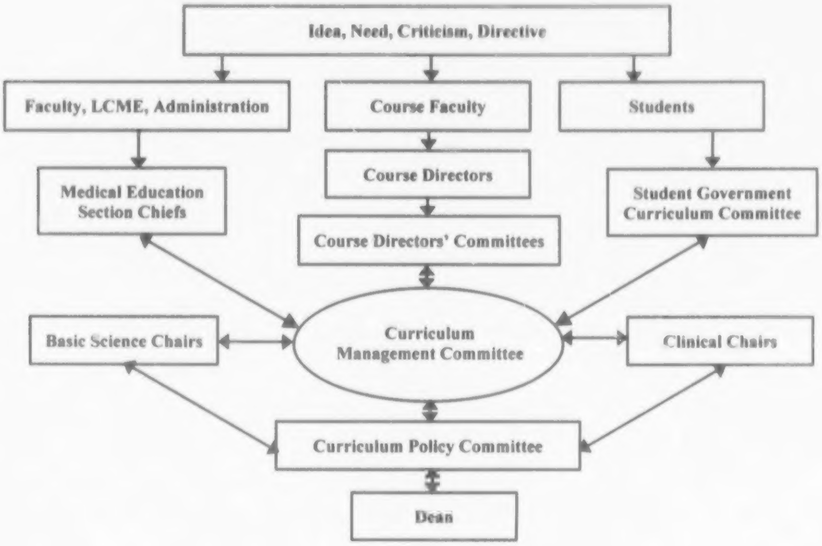
Curriculum Management and Governance Structure

- In 1998, the position of executive associate dean for medical education was created to lead the newly formed Office of Medical Education (OME) incorporating admissions, curriculum, curricular support, student affairs, continuing medical education, and educational development.
- The executive associate dean and the associate deans for admissions, student affairs, and preclinical education and the director of the office of educational development constitute an administrative council for medical education called the medical education section chiefs (MESCs).
- The broad responsibilities of the OME across the diverse components of medical education, from admissions to postgraduate education, are closely integrated and coordinated, facilitated by the participation of the associate deans in activities across the OME
- The curriculum is governed and managed through a mechanism diagrammed in Figure 1.

Office of Educational Development

- The UNC medical school's Office of Educational Development (OED), which is now part of the Office of Medical Education, was established in 1970 as the Office of Medical Studies. From 1979 to 1988 the office was known as the Office of Research and Development in Education for the Health Professions. It has been called OED since 1988.
- This office and its primary responsibilities have shifted in the past decade from a research orientation to institutional support. OED now concentrates more intently on the medical school curriculum and less on independent initiatives. OED is responsible for providing expert consultation and technical assistance to faculty for

FIGURE 1: Curriculum Policy Making: 2000


Idea, Need, Criticism, Directive
Faculty, LCME, Administration
Course Faculty
Students
Medical Education Section Chiefs
Course Directors
Course Directors' Committees
Student Government Curriculum Committee
Basic Science Chairs
Curriculum Management Committee
Clinical Chairs
Curriculum Policy Committee
Dean

This diagram refers to the final approval process for draft policies. For the development of ideas, and for the conduct of day-to-day operations, members of each group freely interact with any individual in any group.

course design and curriculum development, course and curriculum evaluation, student assessment, and faculty development. In collaboration with the Office of Student Affairs, OED offers services for academic counseling.

- The composition of the office staff has changed since 1990, when there were 29 personnel in the office, including eight faculty, ten program staff, six administrative/clerical staff, and five graduate students. At the end of the decade, the distribution of personnel had shifted to include three faculty (plus one part-time faculty member), 12 program staff, eight administrative/clerical staff, and five graduate students.
- OED is supported by both medical school and external funds; however, grant activities now are more directly related to supporting aspects of the medical school curriculum.

Budget to Support Educational Programs

- Budgetary support for teaching follows the traditional departmental model and structure.
- Funding for the administrative costs of medical education, student support services, on- and off-campus teaching facilities, information and technology resources for teaching, curriculum management structure, and community-based teaching activities are allocated through state-appropriated and dean's office funding of OME-managed discrete budgets.
- Funding for special educational projects and curricular or technology innovations is often provided by grants and awards administered by the School of Medicine, Division of Health Affairs, or the University.
- An Educational Technology Group has added two new state-funded positions over the past four years, bringing the total personnel to eight full-time staff. Additional state funds totaling $50,000 per year have been allocated for equipment and supplies over the past four years.

Valuing Teaching

- A long-established system of student-elected awards for innovative and excellent teaching was recently supplemented by substantial monetary awards from university sources to outstanding teachers.
- The curriculum management structure encourages active participation of course directors in the decision-making process.
- Funding for special educational projects and curricular or technology innovations is available through various university and school grants, awards, and administrative budgets.
- The Teaching Scholars Program, established ten years ago, is sponsored by the Office of Educational Development. The purpose of the program is to enhance faculty understanding of education and to improve their knowledge and skills in several aspects of medical education. Faculty are nominated to participate in the program, which is open to 10–13 faculty each year.
- Teachers are expected to be guided by the Responsibilities of Teaching Faculty, written by a faculty committee and approved by the Curriculum Policy Committee in 1996.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In 1996 the Curriculum Policy Committee approved a statement of the Educational Objectives of the MD Program that provides overall general principles for the undergraduate medical curriculum.
- In the fall of 1997, the Longitudinal Clinical Skills Committee was established and charged with identifying specific skills medical students should master by graduation. In the spring of 1998, lists of clinical skills organized by organ system were circulated to selected clinical faculty (course directors, clerkship directors, and selective/elective directors) to be rated as essential, useful, or inappropriate for UNC graduates. In addition, all surveyed faculty were asked to rate exit objectives for interviewing skills and professional behaviors as either essential, useful, or inappropriate for UNC graduates.
- A final list of exit objectives for clinical skills, interview skills, and professional behaviors that were rated essential/useful by a majority of the respondents was produced. A draft list of the clinical skills exit objectives was then submitted to each of the school's curriculum management committees for review.

Changes in Pedagogy

- The primary pedagogic changes that have been instituted relate to integration and coordination of content across courses, use of computer-assisted instruction, problem-based learning/small-group learning, seminars, use of standardized patients, and video-assisted instruction.

Application of Computer Technology

- Every incoming student is required to purchase a particular laptop computer. We are currently in the third year of this requirement. Student laptops are pre-configured with network access and dial-up access to an Internet service provider, and have a specially developed desktop for easy access to key materials.
- Students are provided with medical school e-mail accounts (Web-based and imap access), printer access, and T1 network/Internet access 24 hours a day at school.
- All course syllabi are presented online. In 1994 the Electronic Syllabus project was instituted to move our printed syllabi into the electronic format. The Electronic Syllabus is a tool for learning and reference that supplements traditional hard copy with high-quality digitized images, links to educational tools and sites, and an organized Web site for each class (schedules, newsgroups, resources, events, etc). Grades are available on-line. HTML pages, PowerPoint presentations, and images can be downloaded to student laptops for home use.
- Students access curriculum materials through an interactive weekly calendar ((http://www.med.unc.edu/yr1/welcome.htm)).
- Technology-enhanced lecture rooms contain T1 lines, LCD projectors and computers, and laptop hookups are in place at individual student lab desks. Student study rooms are equipped with LCD projectors and T1 connections. Student conference rooms are wired as well, and LCD projectors are available for loan.
- Web-based forums for discussions and announcements are used by students of all years and by faculty.
- Materials for third-year clerkships are on-line. Connections have been set up in clerkship sites in the hospital to provide access for student laptops. A printer is located in each clerkship area.
- A clinic template that gathers patient data and returns information about patient problems (developed in part by a second-year student) is being piloted during the first- and second-year community experiences. It is expected to be used in the first three years of the curriculum as a way for both students and faculty to track the types and numbers of patients seen by students during their patient experiences.

Changes in Assessment

- OSCE
  - In 1986, the school formalized its requirement for an OSCE as the summative assessment for the second-year Physical Diagnosis course. Standardized patients (SPs) are used to assess the interviewing skills of first- and second-year medical students.
  - At the conclusion of the second-year Introduction to Clinical Medicine course, students now encounter ten to 12 stations requiring them to demonstrate focused physical examinations (some use SPs and others use first-year medical students), but also encounter SPs from whom they elicit histories and for whom they must determine and perform the appropriate physical examinations and develop problem lists. Faculty members observe most of the stations by being present in the exam room and observe all of the extended SP encounters via video monitor.
- Clinical performance examination

  In 1994 the school instituted a comprehensive clinical performance examination (CPX) that is administered during the first four months of the fourth year. Developed in conjunction with the North Carolina Medical Schools Consortium, this exam comprises 16 cases and is scored pass/fail. Students receive five skill scores: relationship, communication, physical examination, history taking, and assessment/management. This eight-hour authentic assessment is conducted in the Ambulatory Care Facility on Saturdays, and students must register a passing score to graduate.
- Computer-assisted test management

  OED is developing and managing the UNC Comprehensive Test Item Management System (CTIMS). The self-assessment component of CTIMS includes a Web-based program for first- and second-year courses. Accessible from on or off campus, these self-assessment instruments include personalized feedback and author-generated justifications for correct responses. In the third year, the internal medicine clerkship requires approximately 20 case write-ups to be submitted electronically to the clerkship director for review and feedback. Both the family medicine clerkship and the pediatrics clerkship include computer simulations as part of their curricula.

Clinical Experiences

- Students are trained in all generalist and specialty areas on campus using the UNC tertiary care hospital complex, which now includes a Neurosciences Hospital, Women's and Children's Hospital, and an ambulatory care center.
- Students also are supervised in clinical activities in a well-established Area Health Education Center (AHEC) program, which supports the medical school in establishing and maintaining over 650 local hospitals and com-

munity practices as teaching sites around the state. These experiences teach clinical skills, demonstrate primary care practice, and expose students to opportunities and challenges in community-based medical practice. The AHEC program supports over 40% of the clinical rotations of each UNC medical student.

- During the first two years students complete two required, competency-based courses entitled Introduction to Clinical Medicine (ICM).
  - Every student is assigned to a physician in a local North Carolina practice at the start of the first year. The majority of the practices are primary care.
  - The core ICM curriculum introduces students to the basic professional and clinical skills necessary to become a physician, through longitudinal clinical experiences in community practices, collaborative learning experiences in small groups on campus, participation in a simulated patient program, and exchange of feedback with tutors, preceptors, and peers.
- The third-year curriculum is devoted to clinical training. Approximately 35% of the third-year curriculum takes place in an ambulatory care setting.
  - In 1995, four changes were implemented. The family medicine clerkship was extended from four to six weeks; the surgery clerkship was reduced from 12 to eight weeks, a new free-standing, week-long Life Support Skills course was added; and a new optional, week-long Advanced Life Support Skills course was added (accessible to approximately 80 students).
- During their fourth year, students are required to take four clinically based courses: an acting internship (inpatient); an ambulatory care selective (entirely community-based); a clinical neurosciences selective (inpatient and ambulatory clinics); and a critical care selective (inpatient and ambulatory clinics). Most students choose additional clinical one-month electives to complete their seven required senior training months.

Curriculum Renewal

A major review of the four-year curriculum was completed in 1995. In 1998, consideration was given to conducting a full-scale review of the curriculum after concerns had been expressed that students were not achieving as well as should be expected. An ad-hoc committee determined that a formal curricular review was unnecessary and that institution of a continuous quality improvement (CQI) process would be a better long-term strategy. This CQI strategy involves (1) specifying desired student learning outcomes, (2) gathering information about the extent to which these outcomes are achieved, (3) making data-driven changes in educational and support programs, and (4) monitoring the effects of program changes, i.e., reassessing achievement of outcomes.

Future Goals

- Some of the major curricular issues facing the school in the next five years are
  - encouraging primary care career choice, as mandated by the state
  - incorporating additional content areas such as cultural competence and palliative care
  - integrating content horizontally and vertically
  - incorporating more opportunities for active learning
- To address these issues will require resources such as
  - facilities to support active learning, especially small-group learning and the teaching and evaluation of clinical skills
  - development and maintenance of off-campus teaching sites
  - expanded capabilities for using information technologies in teaching
  - support for faculty development

Wake Forest University School of Medicine

CAM ENARSON, MD, MBA

Curriculum Management and Governance Structure (See Figure 1)

- The Committee on Undergraduate Medical Education is responsible for the curriculum and is chaired by the associate dean for medical education.
- There has been a recent curricular renewal effort, with the decision to leave intact the basic curriculum management structure.
- Course structure changed with the integration of departmentally-based courses into large multidisciplinary courses.
- Course directors and topic coordinators are appointed annually.
- The structure of the clinical years remains largely departmentally based.

Office of Education

- The Office of Medical Education (OME) is an outgrowth of the Office of Educational Research and Services established in 1978.
- Responsibilities of the OME have changed appreciably, including assisting faculty with the development and implementation of computer-based testing.
- The OME promotes educational development activities and supports the faculty, administration, and students through service and research.
- The student examination service provides
  - editing of test questions
  - scoring of examinations
  - analysis of examination data
  - consultation on interpretation of examination statistics
- The OME conducts educational research and evaluation studies.
- Instructional design services include assistance with curricular design and individual consultation with instructors seeking assistance in preparing for teaching.

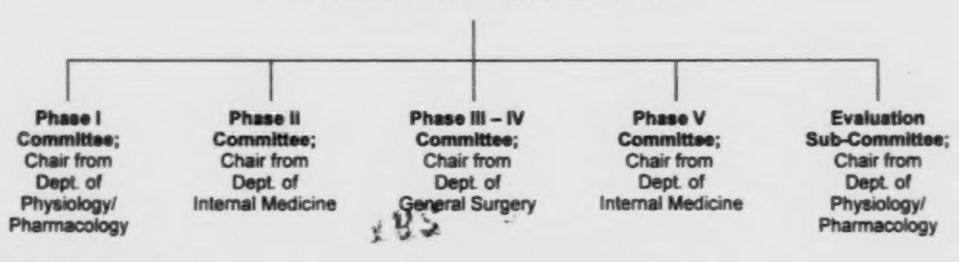
Budget to Support Educational Programs

- The senior vice president for health affairs and the dean provide support to departments for the educational program from institutional funds.
- Mission-based budgeting has been implemented over the past several years; this has facilitated linking of funds with specific educational efforts.
- Institutional funds come from a variety of sources, including tuition and interest from endowments.

Valuing Teaching

- Faculty administrative efforts for various segments of the curriculum have been included in the calculations for mission-based budgeting.
- Faculty participation in curriculum is recognized by letters sent to the faculty member and department chair for inclusion in the teaching dossier.
- Teaching awards given:

FIGURE 1: Prescription for Excellence: Committee on Undergraduate Medical Education


Associate Dean for Medical Education
Phase I Committee; Chair from Dept. of Physiology/Pharmacology
Phase II Committee; Chair from Dept. of Internal Medicine
Phase III – IV Committee; Chair from Dept. of General Surgery
Phase V Committee; Chair from Dept. of Internal Medicine
Evaluation Sub-Committee; Chair from Dept. of Physiology/Pharmacology

BEST COPY AVAILABLE

    - All classes individually select basic and clinical science Teachers of the Year.
    - All four classes select one Teacher of the Year.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

The school has adopted some of the Medical School Objectives Project objectives for use within the curriculum. In addition, the following outcomes have been identified.

- Ten principles identified during the curriculum renewal process:
    - Leadership
    - Lifelong learning
    - Exploration and discovery
    - Practice of medicine
    - Professional attitudes and behaviors
    - Health promotion and disease prevention
    - Teaching–learning process
    - Admission process
    - Students' evaluation
    - Faculty development and recognition
- Seven educational goals developed originally in 1994, were reaffirmed:
    - Self-directed and lifelong learning skills
    - Core biomedical science education
    - Clinical skills
    - Problem solving/clinical reasoning skills
    - Interviewing and communication skills
    - Information management skills
    - Professional attitudes and behavior

Changes in Pedagogy

- Problem-based cases serve as the anchor point for each week of instruction.
- Students meet in small groups of six students with two faculty facilitators (one basic and one clinical science).
- The small-group format is used in the Medicine as a Profession and Population Health/Epidemiology courses; the small groups alternate weekly with lectures.
- Students are required to have, at minimum, two half-days completely free of scheduled activities to allow time for independent study.
- Three to four half-days are available for lectures and labs.
- There has been a decrease in lecture time with the implementation of the new curriculum—typically no more than nine to ten hours of lectures per week.
- Standardized patients are used for both instruction and evaluation.

Application of Computer Technology

- Every student is provided with a computer at the time of matriculation and a personal digital assistant prior to the start of clinical clerkships.
- The first three phases of the curriculum have been computerized.
- A computerized weekly calendar provides links to all scheduled activities for the week.
- Faculty lectures and slides are accessible from the weekly calendar.
- Problem-based learning cases are computerized; case radiographs and laboratory values are linked from within the cases.
- On-line access to library's resources, external Web-based resources, and software are available via network ports
- Correspondence with classes is conducted electronically wherever possible.
- Student evaluation of courses and faculty has been computerized.
- Computer resources necessary to support clinical clerkships are being inventoried now.
- Palm-top devices serve as information reservoirs for students, facilitating tracking of patient encounters.

Changes in Assessment

- Every student is required to participate in four standardized patient assessments (SPAs).
- History, physical examination, and communication skills are evaluated in SPA Part I using standardized patients.
- Clinical reasoning skills and knowledge acquisition are evaluated in SPA Part II.
- Second-year students complete an OSCE exam at the end of Phase II; standardized patients are utilized in this examination.
- A clinical practice examination (CPX) using standardized patients is administered at the end of the third academic year.
- Computer-based testing has been introduced to a limited extent.

Clinical Experiences

- Students spend eight weeks with a community-based practitioner during the first 20 months of the educational program. This period of learning is called the Community Practice Experience (CPE).
- The CPE is used to enhance clinical skills and give the student the opportunity to conduct a community health assessment.
- During required clinical clerkships (Phase III), students spend 16 of 48 weeks in an ambulatory setting.
- New ambulatory clerkships in pediatrics, internal medicine, and women's health have been developed, and the family medicine clerkship has been retained in the new curriculum.
- 32 weeks of Phase III are inpatient-based in the clerkships.
- During Phase IV, students complete two advanced inpatient management clerkships and clerkships in intensive care and emergency medicine.
- Elective experiences are available in inpatient and outpatient settings across a variety of disciplines.

Curriculum Review Process

- Ten principles serve as a foundation for the new curriculum: (see under Learning Outcomes)
- A four-phase planning process was initiated in November 1995:
    - Phase I—development of basic principles to serve as the foundation for a new curriculum. Reaffirmation of existing goals of medical student education program. Completed May 1996.
    - Phase II—Development of the structure and format for the new curriculum. Completed June 1997.
    - Phase III—Determination of the details of curricular content and scheduling. Completed Spring 1998.
    - Phase IV—Phased implementation over four years beginning in August 1998.

Evaluation of the change:

- A curricular map was created using the AAMC's Curriculum Management and Information Tool (CurrMIT) database.
- A computerized course/clerkship faculty evaluation system was implemented.
- A program evaluation plan was developed and linked to the goals of the new curriculum.
- Standardized patient examinations are utilized for assessment of clinical skills, self-directed learning and problem-solving/clinical reasoning skills, and communication skills.
- Outcome indicators include
    - student performances on institutional and licensing examinations
    - student responses to AAMC Matriculant and Graduation Questionnaires
    - advancement and graduation results
    - NRMP results
    - student satisfaction and career choices

University of North Dakota School of Medicine and Health Sciences

MEDICAL STUDENT EDUCATION COUNCIL

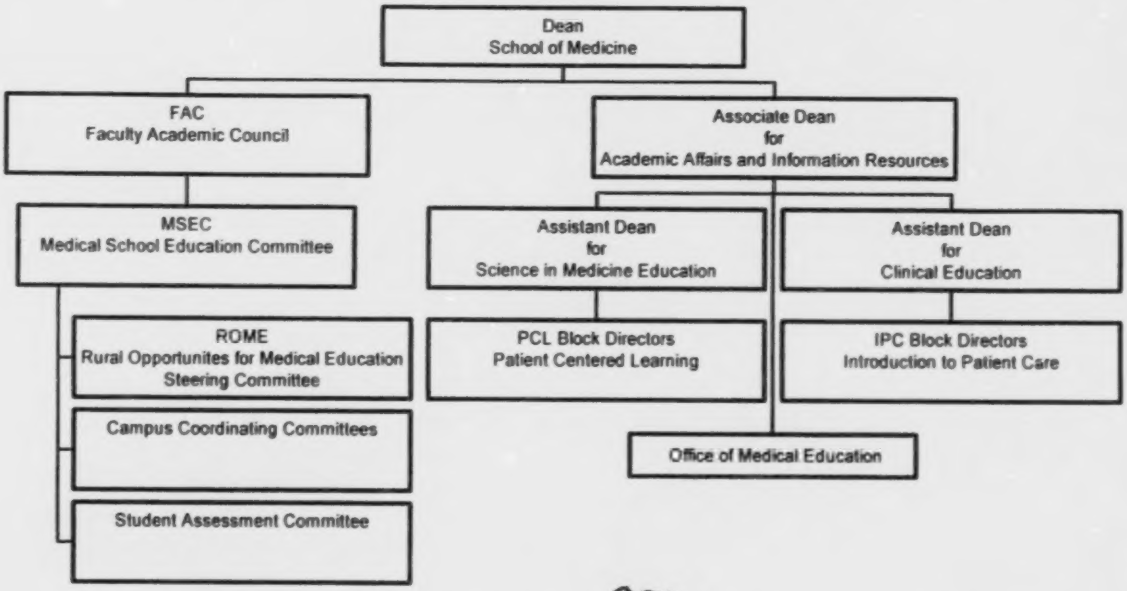
Curriculum Management and Governance Structure (See Figure 1)

- The Faculty Academic Council (FAC) provides the governance of all policies and makes recommendations to the dean regarding the standardization of educational experiences and student evaluation across all disciplines and sites.
- The educational objectives were developed by the Medical Student Education Committee (MSEC) over two years of planning for a curriculum revision.
- MSEC has the authority for policy decision making within the curriculum.
- This centrally-based structure with wide involvement of faculty from all disciplines provides the management structure needed to define, implement, and evaluate an integrated education curriculum for medical students.

Office of Education

- The Office of Medical Education (OME) was established in 1997 to provide a wide range of educational services and consultations to faculty and curricular blocks.
- OME coordinates, develops, integrates, and evaluates the educational resources, services, and activities of the school's medical education program.
- Functions of the OME include:
  - curriculum and faculty development
  - training and use of standardized patients
  - student database support
  - supplemental learning
  - program development and evaluation
  - educational research
  - student assessment
  - library resource support

FIGURE 1: Curriculum Governance and Management Structure


Dean
School of Medicine
FAC
Faculty Academic Council
Associate Dean for Academic Affairs and Information Resources
MSEC
Medical School Education Committee
Assistant Dean for Science in Medicine Education
Assistant Dean for Clinical Education
ROME
Rural Opportunites for Medical Education Steering Committee
PCL Block Directors
Patient Centered Learning
IPC Block Directors
Introduction to Patient Care
Campus Coordinating Committees
Office of Medical Education
Student Assessment Committee

  - graduate medical education
  - computer informatics

Budget to Support Educational Programs

- Financial support has been achieved by a redefinition of priorities and the reallocation of resources for the school.
- An increase in student tuition fees targeted for curriculum and grants for rural and supplemental instruction are used to finance the costs of medical education.

Valuing Teaching

- A task force on faculty performance in education was formed to examine the evaluation process to address the changes in faculty instructional roles, responsibilities, and delivery methods.
- The task force developed recommendations (which will be forwarded by the dean to FAC for consideration) that address the essential and related areas of faculty performance, and the data to be collected.
- Faculty evaluation will be aligned with the school's vision and mission.
- Specific faculty evaluation goals are to:
  - tie all aspects of the process to the school's mission;
  - involve faculty in all aspects of evaluation;
  - apply all evaluation procedures consistently and fairly;
  - ensure administrative commitment to the evaluation process and adherence to due process and the criteria for evaluation and appeal;
  - balance institutional needs with individual faculty needs;
  - link evaluation to faculty development and rewards, retention, and/or dismissal; and
  - include multiple sources of faculty data in evaluation.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Task forces developed the details of a revised curriculum. The changes were incorporated into a draft document which was discussed with faculty and students in February 1997.
- As a result of feedback from the task forces and FAC, a goals and objectives report was prepared for presentation to the dean and faculty.
- The goals and objectives document was unanimously accepted by a FAC vote in June 1998.
- The objectives relate to medical student learning, governance of the curriculum, faculty development, evaluation of students, curriculum management, social responsibilities of the medical school, educational strategies, and teaching methods.
- A description of the exit objectives that students must achieve to graduate still needs to be developed. The clinical faculty have begun to specify the clinical knowledge base, skills, values, and attitudes that students should acquire and develop during their clinical education.

Changes in Pedagogy

- "Patient-centered learning in small groups emphasizes problem solving and decision making, affords an opportunity to ensure a balanced learning experience, and addresses longitudinal issues, including continuation of the learning of biomedical science principles throughout the curriculum." [From the goals and objectives report.]
- The first two years of medical school feature learning in small groups of eight students, meeting three times a week for two hours with a faculty facilitator—patient-centered learning (PCL).
- PCL sessions are supported by laboratory exercises, interactive question-and-answer sessions, demonstrations, and concept-anchoring lectures throughout the week to reinforce key concepts or skills.
- A clinician presents the case of the week to the entire class on Friday in a "wrap-up" session.
- When possible, actual patients are invited to these sessions to answer questions and interact with the students.
- The PCL program is divided into eight ten-week blocks (four blocks in year one and four blocks in year two).
- Using an organ-systems approach, year one focuses on the study of normal human biology, integrating anatomy, physiology, neuroscience, biochemistry and molecular biology, pharmacology, microbiology, and immunology.
- Year two focuses on human pathobiology, integrating pathology and pathophysiology with concepts learned in each of the aforementioned year-one disciplines.
- Students begin to learn the practice of medicine in the first year.
- Clinical skills teaching, experiences in communicating with patients, community service programs, and experiences in physicians' offices are part of the curriculum from almost the first day of medical school, allowing stu-

dents to correlate what they are learning in their basic science classes with the world of patient care.

- Students gather data related to patient cases, generate and test their hypotheses, and engage in clinical reasoning discussions that are pertinent to the care of patients.
- Students learn sciences basic to medicine integrated with issues such as medical ethics, community and preventive medicine, and the essentials of patient interviewing and physical diagnosis.
- Ethical, preventive, and epidemiologic issues are incorporated into case studies.

Application of Computer Technology

- Computers in each small classroom are essential for presentations of patient-related data and for electronic instructional delivery of information related to clinical/basic science objectives.
- Computers are used for addressing important issues for the health sciences curricula (i.e., clinical reasoning skills, independent learning, information management, lifelong learning skills, professionalism, problem solving, and integration of basic science/clinical concepts).
- A computer technology laboratory has been developed to help prepare students for taking computerized licensure exams and provides interactive classroom instruction opportunities for students, faculty, and staff.

Changes in Assessment

- There is a centrally managed, comprehensive system of learner assessment, including a well-developed student database.
- The assessment system enhances cooperation and collaboration, and diminishes competition among students.
- Students are evaluated frequently by facilitators and preceptors to document strengths, weaknesses, and the need for remedial education.
- Participation in patient-centered learning sessions is monitored and assessed (both orally and by written account) by a faculty member.
- Ongoing and end-of-block assessments include, but are not necessarily limited to, assessing the student's ability to formulate problem lists, access medical literature and expert resources, and refine diagnoses.
- Standardized multiple-choice and modified essay questions are used to test student knowledge, skills, attitudes, and behaviors.
- Professional behavior is addressed in the formal evaluation of students.
- Graduating medical school students must demonstrate basic knowledge applicable to the practice of medicine by successfully passing internal subject examinations and USMLE exams.
- Future assessment procedures will include the use of selected elements of history taking, physical examination, and procedural skills that may be tested in a multi-station OSCE format, using either standardized or actual patients.

Clinical Experiences

- "Medical students receive in-depth ambulatory primary care exposure and the opportunity to work with generalist role models. Third- and fourth-year students are taught in primary care settings, where they develop continuity of patient care skills and observe the effects of therapy." [From goals and objectives report.]
- The curriculum emphasizes a rural focus and provides students with experiences in the state's rural hospitals and physicians' practices.
- New educational approaches provide a strong generalist base (regardless of final career choice), maintain interest in primary care, and create an educational environment that helps fulfill the institutional mission.
- Introduction to Patient Care (IPC) helps students develop skills in communication with patients and in physical examination during the first two years of medical school.
    - IPC teaches patient history and interviewing skills, physical examination skills, and problem-solving skills.
    - Students discuss ethical, socioeconomic, populations, and statistical issues.
    - Students learn to think about the patient as a person.
    - Students must understand the scientific basis of normal and diseased human biologic systems to achieve the prevention and management of goals of medical practice.
    - Standardized patients are used in the curriculum to give an appropriate history for a particular medical problem and to simulate symptoms and physical findings. They also give feedback to and work with the students to perfect examination techniques.
- Ambulatory care experiences (ACEs) are designed to prepare students for their first clinical rotations.
- Prior to their third year, students are introduced to many hospital activities, personnel, and procedures they will encounter during their clerkships.

- In their first year, students spend time in primary care settings, gaining firsthand experience in real-life clinical situations.
- The school encourages students to choose primary care fields such as family practice, general pediatrics, and general internal medicine.
- All third-year clerkships contain substantial continuity-of-care and ambulatory experiences.
- Required internal medicine and surgery acting internships allow third- and fourth-year students (as they progress in their skills) to assume graduated responsibility in the care of acutely ill inpatients.
- Rural Opportunities for Medical Education (ROME) is an eight-month, alternative third-year experience in a rural primary care setting. This program is selective and admission is competitive.
- Students learn about the problems commonly encountered in primary care, including routine health maintenance, medical emergencies, and unusual diagnoses.
- Students have the opportunity to work with rural primary care physicians as well as board-certified surgeons, internists, pediatricians, and other specialists.

Curriculum Review Process

- Curriculum review is an ongoing process.
- MSEC routinely reports to faculty prior to and during implementation of curriculum changes.
- Themes for curriculum renewal:
  - Interdisciplinary cooperation in the planning, delivery, and evaluation of medical education through interdepartmental collaboration
  - Improved integration of sciences basic to medicine and clinical experiences in the curriculum
  - Development of interdisciplinary revisits to the basic sciences in the third and fourth years of the curriculum
  - Centrally managed program evaluation
- Design used for renewal process
  - Creation of climate for change—faculty retreat and planning
  - Development of facilitative leadership—Medical Student Education Council
  - Development of problem-solving structures, including special task forces
  - Integration across departments and creation of supportive relationships
  - Flexibility of resources
  - Development of Office of Medical Education
    - —Upgrade of progress—Report to FAC, February 1997
    - —Endorsement of goals and objectives by FAC, June 1998
    - —Implementation of year one—fall 1998
    - —Implementation of year two—fall 1999
    - —Implementation of year three—fall 2000
    - —Full implementation of revised curriculum—fall 2001
- Planning and implementation resources needed
  - Faculty time
  - Travel, phone, and secretarial assistance for planning meetings
  - Development of an Office of Medical Education infrastructure with project directors who believe strongly in the change philosophy
  - Services provided by various departments of medical school, including library support, distance learning/audiovisuals, computer technology assistance, student records
  - Administration officials who have the initial vision and resources to make change happen and maintain a dynamic curriculum
  - Medical Student Education Council (MSEC) members who take risks, cut through bureaucracy, reduce fragmentation of services
  - Interdisciplinary task forces established
  - Special-committee structures that often interface with MSEC structure
- Challenges
  - The flood of 1997 delayed implementation by one year
  - Faculty and staff time for planning and implementation
  - Creation of better understanding of patient-centered curriculum and case-based learning
  - Procurement of funding for implementation, somewhat eased by board approval for an increase in tuition for medical students
  - Ongoing negotiations for implementation and sustained curricular changes across the state with preceptors, four medical school campuses, and numerous health care delivery systems
- Plans for evaluation of change
  - Development of an electronic student database system, featuring a student performance portfolio encompassing all four years
  - Student and faculty evaluations following each of the eight learning blocks in years one and two
  - Comprehensive and integrated block assessment, designed with basic science and clinical science faculty input
  - Pre and post comparisons of USMLE board scores
  - OSCE and other comprehensive assessments given at

  - end of year three; performance results to be used for prescriptive planning for students' fourth year
  - Longitudinal studies on residential placements and success, practice choices, and career satisfaction
- The curriculum planning and implementation process requires ongoing review to identify successes in meeting the objectives and to determine what changes are necessary.
- MSEC established curriculum goals and objectives to guide the review process and set program evaluation standards.
- Department chairs and faculty require a broadly integrated view of general undergraduate medical education.
- There is an ongoing need for coordination of horizontal and vertical integration of basic and clinical information throughout the curriculum at all geographic sites, which is linked to curriculum planning, program evaluation, and faculty development.

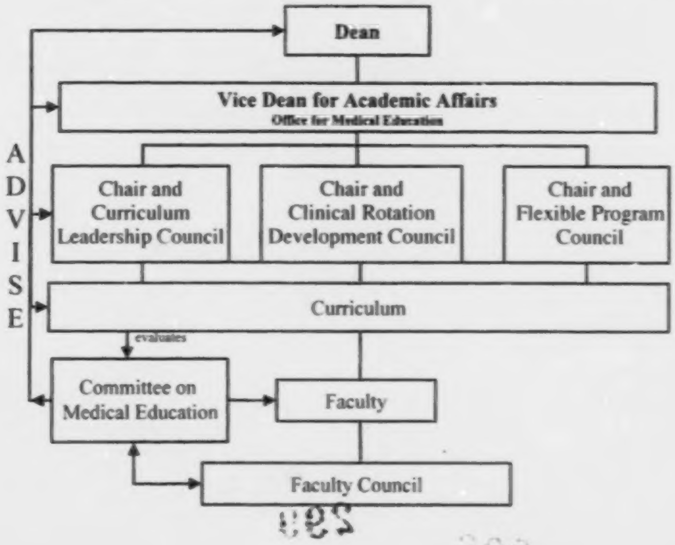
Case Western Reserve University School of Medicine

MARCIA Z. WILE, PHD, AND C. KENT SMITH, MD

Curriculum Management and Governance Structure

- The faculty, through several faculty committees, determine the content of the curriculum.
- The evolving governance structure for the curriculum is illustrated in Figure 1.
- The vice dean for medical education and academic affairs reports directly to the dean.
- There is an associate dean for biomedical information technologies whose efforts are largely devoted to the curriculum.
- Three coordinators are responsible for the day-to-day management of the major parts of the curriculum, specifically the core academic program, the patient-based program, and the flexible (elective) program.
- Two new councils have been formed. They include the Curriculum Leadership Council (CLC) and the Clinical Rotation Development Council (CRDC).
    - The CLC was established in February 1999 and is composed of the faculty teaching leadership.
    - The CLC is charged to oversee integration and coordination among the basic and clinical science components of the first two years of the curriculum.
    - A basic scientist who is an elected member of the committee on medical education chairs the CLC. The council has monthly meetings and half-day retreats.
    - The CLC created the schedule and sequence of the subject committees for the revised first-year curriculum that was implemented in August 1999.
    - The CLC has developed the schedule for the revised second-year curriculum, to be implemented in August 2000.
    - The CRDC was established in April 1999.
    - The mission of the CRDC is to develop a "consensus-based curriculum revision" for the core clerkship program.
    - Although all clerkship directors are members of the CRDC, it was acknowledged that clinicians cannot meet regularly and the group was too large. A steering committee was established with representation from each core clerkship discipline, the primary care track, and administration.
    - The steering committee meets monthly as necessary, and there are plans to hold whole-day retreats once or twice a year for the full CRDC and other faculty.
- In 1999 the dean established a faculty committee to revise the educational administrative structure.

FIGURE 1: Proposed Structure for Medical Education


Dean
Vice Dean for Academic Affairs
Office for Medical Education
ADVISE
Chair and Curriculum Leadership Council
Chair and Clinical Rotation Development Council
Chair and Flexible Program Council
Curriculum
evaluates
Committee on Medical Education
Faculty
Faculty Council

Office of Education

- The Office of the Vice Dean for Medical Education and Academic Affairs works with the CLC and CRDC and provides support for the educational program.
- Doctoral-level professional educators participate in the administration and evaluation of the curriculum.
- There is seamless integration with the Office of Biomedical Information Technologies, established in 1996, and the associate dean for biomedical information technologies, who was appointed in 1997.
- The responsibilities of the office include technical development and maintenance of the electronic curriculum, preparation of examinations, and computer processing of examinations.

Budget to Support Educational Programs

- The educational program is supported by core funding to the Office of the Vice Dean for Medical Education and Academic Affairs and to the basic science and clinical science programs.
- Grants provide supplemental funds.
- There is a budget for biomedical informatics teaching.

Valuing Teaching

- Support from the dean's office is provided to course leaders.
- There are highly valued awards to the faculty for excellence in teaching.
- Teaching excellence is considered significantly in the appointment and promotion process.

CURRICULUM RENEWAL PROCESS

- A guiding principle of the curriculum renewal efforts is the school's statement of purpose:

> Case Western Reserve University School of Medicine will graduate physicians who have a scholarly foundation in the basic and clinical sciences, recognized expertise in individually selected areas of special interest, possess the ability to integrate science and humanistic values across disciplines, are responsive to the needs of individual patients and to their communities, and take the initiative to become scholars and leaders in their chosen fields.

- Themes of curriculum renewal are
    - to delineate learning objectives of the curriculum
    - to define core concepts of basic science and clinical science curriculum
    - to expand and refine the multimedia electronic curriculum
    - to integrate a longitudinal approach to core curricular concepts of teaching and learning
    - to optimize the use of small-group/independent, self-directed learning
    - to vertically integrate basic science and clinical science curricular components
    - to adapt the lengths of core clerkships to the content objectives
    - to promote integration of teaching and learning experiences among the clinical disciplines
    - to facilitate enhanced collegial interactions between faculty and students
    - to structure a scholarly electives program
    - to integrate doctor–patient communication, professionalism, ethics, and population perspectives
    - to introduce the molecular basis of medicine and the structure of the human body early in the curriculum
    - to increase ambulatory clinical experiences
    - to ensure mastery through performance-based assessment linked to learning objectives
    - to teach appropriate patient-centered, culturally sensitive, and diversity-oriented medicine

Learning Outcomes

- Faculty and appropriate faculty committees delineate learning objectives for the core academic program and clerkships.
- The committees on medical education, the CLC and the CRDC, are involved in determining outcomes for the curriculum.

Changes in Pedagogy

- Problem-based learning is used in the core physician development program and the integrated clinical experience program.
- There has been an increase in small-group activities, and more will occur in the revised core academic program.
- Cases are used in the integrated clinical experience, core physician development program, and clinical correlations to introduce concepts to students.

- Standardized patients are used in the first- and second-year interviewing program and in physical diagnosis.

Application of Computer Technology

- Beginning with the students in the class of 1997, who matriculated in 1993, the school has given computers to all first-year students.
- The school has an electronic curriculum.
- The purpose of the electronic curriculum is to provide students with Web-based learning objectives and resources to achieve the learning objectives for each student–faculty interaction.
- The electronic curriculum provides a means of communicating with faculty and delivering examinations for self-assessment as well as outcome evaluation of achievement of the learning objectives.
- The electronic curriculum is designed to be the students' integrated learning resource throughout the four-year curriculum.
- Faculty are encouraged to reference electronic learning resources whenever appropriate.
- If appropriate, faculty can write their own electronic resources, including textual material, illustrations, digitized slide collections, and multimedia features.
- The office of biomedical information technologies is working with the faculty to develop the electronic curriculum.
- A collaboration has been established with the Cleveland Institute of Art to create original animations and illustrations to facilitate the learning of difficult concepts.
- A system of administering examinations on the students' notebook computers is being developed and will be implemented on a pilot basis.
- Student and faculty advisory committees have been established to guide the development of the electronic curriculum.

Changes in Assessment

- Standardized patients are used in the interviewing-program OSCE, the physical-diagnosis-course OSCE, clerkship OSCEs, and the primary-care-track OSCE.
- Faculty observe students' clinical skills in the four-year clinical program, in the small groups during the core academic program, and in the integrated clinical experience.
- With the receipt of a grant from the Josiah Macy, Jr. Foundation Project on Health Communications in 1999, the school has been involved in a three-school demonstration project to implement state-of-the-art communication skills across all four years of the curriculum. The project focuses on information-gathering skills, doctor–patient relationship–building skills, and patient education skills.
- Students will be assessed in their abilities to demonstrate these skills in a structured clinical interviewing examination, and will be compared with students who have not participated in this project.

Clinical Experiences

- Students are assigned to patients in their first year (the Family Care Program); this program continues through the second year.
- Students participate in the medical apprentice program (MAP) as part of the flexible program in the first two years.
- Students are in physicians' offices during the MAP, the family medicine core clerkship, the primary care track longitudinal experiences, and various electives.
- Students are on the wards and in clinics during their core clerkships and some electives.
- Students have the opportunity to participate in electives at other medical schools, on Indian reservations, and in international venues.

Curriculum Review Process

- As part of the curricular renewal process, the school is developing learning objectives for every component of the curriculum.
- There is an increase in student accountability to the curriculum.
- In the first and second years, the CLC was established.
- The CDRC was established for the third-year core clerkships.
- A total of 40 clerkship directors and clinical department chairs were interviewed regarding the overall goals of the clerkship year. The first project of the CRDC was to develop the schedule for the third year. This was accomplished and a 12-month core clerkship year was implemented in July 2000.
- The challenges and unanticipated outcomes included
    - establishing faculty commitment and "buy-in"
    - resistance to change
    - instituting learning versus teaching objectives
    - shifting to assessment mode from testing mode

  - assessing outcomes
  - faculty development in informatics and technology
  - establishing the CLC and the CRDC
  - inspiring excitement, enthusiasm, and active participation of the faculty in CRC and CRDC activities
- Plans for evaluation of the change include
  - monitoring and oversight of the first and second years by the CLC
  - monitoring and oversight of the third year by the CRDC
  - reports to the committee on medical education, faculty council, and general faculty
  - assessment of student competencies (performance, knowledge, skills, attitudes)
  - student performances on internally developed examinations
  - student performances on NBME subject examinations (clinical)
  - student performances on USMLE Step 1 and Step 2
  - student evaluations of curriculum
  - faculty evaluations of curriculum
  - AAMC Graduation Questionnaire
  - career choice of graduates
  - Match results
  - external evaluation
  - external ranking (i.e., the NIH, *U.S. News and World Report*)
  - analysis of applicant and matriculant pool

University of Cincinnati College of Medicine

ANDREW T. FILAK JR., MD

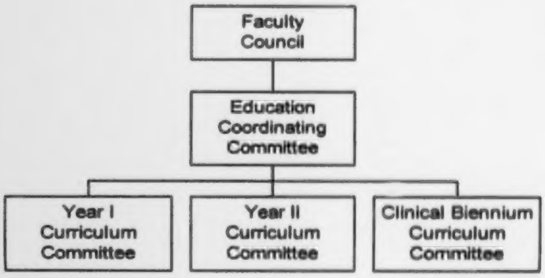
Curriculum Management and Governance Structure (See Figure 1)

- The educational program is coordinated through the Office of Medical Education, led by an associate dean.
- The associate dean serves as chair of the Education Coordinating Committee (ECC). The ECC was created in the early 1990s in response to LCME accreditation standards that require "integrated institutional responsibility for the design and management of a coherent and coordinated curriculum."
- Three standing committees report to the ECC. Membership on each of the standing committees includes course and clerkship directors, faculty at large, and medical students.
- The chairs of the Clinical Biennium Curriculum Committee (covering years 3 and 4 of the curriculum) and the Year I and Year II Curriculum Committees serve on and report at each meeting of the ECC.
- The ECC reports to the Faculty Council, the governing body for the College of Medicine. Faculty Council must approve curricular initiatives.

Office of Medical Education

- The Office of Medical Education has been present at the college for many years and has assumed increasing responsibilities over the last decade. Major activities of the Office of Medical Education include
  - coordinating the activities of and providing staff support for the curriculum committees
  - directly supporting major interdisciplinary courses such as Introduction to Clinical Practice I and II
  - directing the course evaluation process and providing summary results to course directors and curriculum committees
  - coordinating the student evaluation process
  - coordinating the activities of the College of Medicine Promotion Boards
  - coordinating the curricular renewal process

FIGURE 1: Curriculum Governance Structure


Faculty Council
Education Coordinating Committee
Year I Curriculum Committee
Year II Curriculum Committee
Clinical Biennium Curriculum Committee

Budget to Support Educational Programs

- A discrete budget is available to support the activities of the Office of Medical Education. Each year the office prepares a budget request for submission to the dean, as do all departments in the college. The Office of Medical Education budget is subject to the same review and scrutiny as all other budget submissions.
- Funds for teaching activities within the departments are distributed directly to those departments by the dean.
- Departmental funding had previously been based on historical allocations. Over the past decade a model has been created that partially distributes funds based on departmental teaching activities. The formula utilized is based on contact hours in each of the first two years of the medical school curriculum and length of a rotation in weeks multiplied by the number of students on a rotation for the clinical years.

Valuing Teaching

- Faculty whose primary responsibility is the medical student education program are identified and recognized through a variety of means.
  - Teaching awards are presented every year at the college level. The nomination process for these awards is student-driven, with faculty recipients being chosen by those who know their teaching well.
  - At the departmental level, a similar award process recognizes teaching. Although the details vary from department to department, most have some sort of award that uses student evaluations of teaching as part of the decision-making process.

- New ways of evaluating teaching are being explored. A task force charged with integrating principles of total quality management (TQM) into the evaluation process will be formed this year. Currently, the task force is looking at alternative sources of data regarding information about teaching, such as peer evaluation.
- A task force charged with guiding faculty development in teaching effectiveness was also formed in 1999. This task force is assembling a 12-month program called Teaching Effectiveness and Mentoring (TEAM), which looks at ways to improve teaching of selected faculty teaching scholars through a series of lecture sessions, experiential exercises, and mentoring activities. Eventually, the TEAM program will become integrated with the college's new approach to evaluating, using evaluations as a "feeder" system for faculty development in teaching effectiveness.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- As part of the curricular renewal process, the College of Medicine adopted the concept of developmental stages.
  - Stage 1. At the completion of Stage 1 the student should be able to demonstrate the knowledge, skills, and attitudes that will allow him or her to progress into the clinical biennium.
  - Stage 2. At the completion of Stage 2, the student will have demonstrated the knowledge, skills, and attitudes expected of a student who is to be awarded the MD degree.
  - Stage 3. All students are expected to demonstrate advanced levels of competence with specific knowledge, skills, and attitudes based on the experiences and needs of the student.
- The initial emphasis of the curricular renewal process has been on Stage 1, encompassing the first two years of the medical education program.
- The key areas of focus are: conceptual knowledge base, learning and critical thinking skills, interpersonal and clinical abilities, role and responsibility in society.
- The list of core competencies that students are expected to have upon graduation was developed by the Curriculum Renewal Task Force and approved by the Education Coordinating Committee and Faculty Council. [The list of competencies may be obtained from the author.]
- The Clinical Biennium Curriculum Committee has developed a process to identify specific procedural skills a student should be able to demonstrate. Through use of a "passport" approach to documentation, the ability to monitor student performance of and competence in specific procedures is currently being tested.

Changes in Pedagogy

- The curricular renewal process has led to a shift from a traditional lecture-based approach to a more interactive and case-based approach.
- Small-group interactive sessions have increased.
- The structural framework for developmental Stage 1 includes a maximum of 22 contact hours per week with no more than 50% of the contact time scheduled as large-group lecture activity.
- The basic science courses have moved significantly towards content integration, while maintaining a discipline-based format.
- All courses have integrated the use of clinicians and utilize clinical cases as part of the teaching method.
- The College of Medicine has had a longstanding use of gynecologic and urologic teaching assistants as standardized patients for the male and female urogenital examinations. The gynecologic teaching assistants are used both in the Year II physical diagnosis component and in the third-year obstetrics–gynecology clerkship.
- The first-year medical interview course has utilized standardized patients for the past several years. Students obtain experience interviewing the standardized patients in a controlled setting and then proceed to interview patients in a clinical setting.

Application of Computer Technology

- Currently, incoming medical students are not required to purchase personal computers.
- The college created a committee to review and implement the informatics objectives formulated by the AAMC's Medical School Objectives Project (MSOP).
- Students are required to master a number of IT skills throughout the curriculum. These include on-line bibliographic searching, use of clinical information systems to retrieve patient data, use of e-mail, accessing and utilizing on-line self-assessment tools, and use of electronic security systems to access grades and other confidential information.
- Almost half of the fourth-year medical students are enrolling in a medical informatics elective. The committee

is examining ways to integrate the information in this elective throughout the curriculum.

- The Center for Distributive Learning in the Health Professions has recently been established to work with faculty to increase their use of IT in the courses they teach. The college of medicine has hired an instructional designer to help support this effort.

Changes in Assessment

- Plans are under way to develop a clinical skills assessment program utilizing standardized patients.
- A clinical skills assessment center, consisting of 16 modified exam rooms and state-of-the-art audiovisual monitoring equipment, is currently under construction.
- A clinical skills examination, based on the OSCE format, is currently under design. It is anticipated that clinical skills will be assessed in this format in both formative and summative evaluation processes.
- Every student is observed taking a medical history as part of the medical interview course in the first year and performing a complete physical examination in the second year.
- Faculty observation of a complete history and physical is required as part of the internal medicine clerkship.
- Complementing the development of the Clinical Skills Assessment program is the creation of a clinical skills laboratory. This newly designed facility will house various models and computer-assisted devices to facilitate training in specific medical procedures and will be a key part of the formative evaluation process.

Clinical Experiences

- First-year students interview hospital-based patients. Each student is assigned to an office-based physician's practice for several sessions as part of a segment entitled Clinical Opportunities. In addition to shadowing the preceptor as he or she sees patients, the student is expected to discuss aspects of running a practice with the physician and the staff.
- Second-year students are exposed to hospital-based patients as part of their physical diagnosis training. Every student is expected to take a history, perform a physical examination, and develop a basic plan of diagnosis management appropriate to his or her level of education.
- The third-year clerkships and fourth-year electives are a combination of hospital-based and ambulatory setting–based experiences.
- In addition to University Hospital, students may be assigned to the Veterans Administration Medical Center or one of several closely affiliated community hospitals. Pediatrics training, both ambulatory and inpatient, occurs at the world-renowned Children's Hospital Medical Center of Cincinnati.
- Specialized experiences are available at the Shriner's Hospital Burn Institute and the Drake Center, a full-service rehabilitation facility.
- All students are required to participate in a one-month third-year ambulatory family medicine clerkship. This occurs mainly in the offices of community-based preceptors. The Department of Internal Medicine was a pioneer in the establishment of an ambulatory component of the clerkship. Four weeks of the two-month clerkship are experienced in hospital-based clinics and physician offices.
- A fourth-year ambulatory AHEC experience and an additional month of an ambulatory setting–based elective are required.
- The combination of hospital-based clinics (mainly at University Hospital, Children's Hospital, and the VAMC) and a large cadre of community-based physician's practices provides a wealth of ambulatory care opportunities.

Curriculum Review Process

- The college of medicine embarked upon a curricular renewal effort in 1997. The work of the Curriculum Renewal Task Force was to focus on:
    - Integration: among courses in each academic year and across the first two years.
    - Student-centered learning: converting from a passive, lecture-based curriculum to a program that incorporates the concepts of adult learning theory. Alternative formats such as case-based learning; small-group discussion, self-directed learning, and the use of computer-based technology need to be considered.
    - Outcomes analysis: defining the standards expected of the curriculum and of each student to prepare the students for entry into the clinical biennium, licensure examinations, and the eventual clinical practice of medicine.
    - Content review: assuring that curricular content is current and balanced.
- The initial focus of the task force was to formulate a plan to restructure the preclinical biennium. The task force initially adopted a concept of developmental stages. As stated earlier, at the completion of Stage 1, it was anticipated that the student should be able to demonstrate the knowledge, skills, and attitudes that would allow him

or her to progress into the clinical biennium. At the completion of Stage 2, the student should have demonstrated the knowledge, skills, and attitudes expected of a student who is to be awarded the MD degree.

- The task force developed a proposal to restructure the curriculum based on a concept of content blocks. This change in administrative structure for the curriculum was not adopted, as the faculty strongly supported maintenance of a discipline-based structure.
- A new structural framework setting parameters of no more than 22 contact hours per week with no more than 50% of contact hours in large-group lecture-based activities was adopted.
- Stimulated by the curricular renewal process, both the Year I and Year II Curriculum Committees worked diligently to facilitate content integration among the various disciplines.
- Several courses were restructured to accommodate this integration. For example, pharmacology, which had previously been offered as a compact course in one quarter, is now distributed across the entire academic year.
- The task force currently has two working subcommittees. The Subcommittee of Evaluation and Assessment has been charged to review the current system of evaluation of year-one and year-two courses and recommend changes for improvement; and to review current grading and examination policies, with the stipulation that the grading system have at a minimum honors, pass, and fail designations. The Subcommittee on Structure and Content is to develop a strategy for short-term and long-term review of the content of the medical school curriculum.
- The content review process must acknowledge a need for integration in several dimensions: within a course/clerkship; within a given academic year; within a given developmental stage; and across all four years of the curriculum.
- The content review process must include an assessment of new conceptual skills that need to be incorporated into the curriculum in addition to an assessment of current curricular offerings.
- The curricular renewal process is dependent on a significant time commitment of the Office of Medical Education and key faculty. As the work of the task force progressed, it became evident that a lack of staff support is a limiting factor in the development and implementation of change.
- The proposal to restructure the curriculum format included the addition of several staff positions to coordinate the integration. The Subcommittee on Structure and Function plan to establish content-review teams is dependent on the addition of individuals with expertise in education to assist the faculty in this process.
- A key challenge in the curricular renewal process is to keep the faculty and students informed of committee deliberations and plans, and to obtain buy-in at appropriate time intervals. *The level of resistance to structural changes was a surprise.*
- The curriculum renewal process has served to stimulate a dialog among the faculty and heighten awareness of the necessity for a continuous quality improvement approach to the curriculum. Rather than accepting the status quo, the faculty is now challenged to justify current methods or to change them.
- The Education Coordinating Committee's and the various curriculum committees' reviews of the education program occur on an ongoing basis.

Future Goals and Challenges

The curricular renewal process has stimulated a large-scale review of the program. As part of the ongoing review of the educational program, several key issues are under active discussion or are on the active agenda.

- Assessment of the quality of course offerings is a critical issue. The school has a longstanding, detailed approach to course evaluation that is highly dependent on input from students. A more broad-based evaluation system needs to be developed, and the curriculum committees need to utilize the data to better effect curricular change.
- The school continues to struggle with the limited availability of small-group leaders as more curricular initiatives that utilize a small-group format are established.
- Funding for medical education is a hot topic as the faculty are increasingly challenged to expand their productivity as measured by grant holdings or clinical revenue. The lessening availability of clinical preceptors is of particular concern.

Medical College of Ohio

AMIRA F. GOHARA, MD

Curriculum Management and Governance Structure

- Changes in the governance of the medical school curriculum occurred coincident with changes to the curriculum.
- The Curricular Governance Committee was established in October 1998 to advise the dean of the school of medicine, particularly with regard to policies related to the curriculum. The committee has three subcommittees: one for the first two years of the curriculum, one for the second two years, and one for evaluation.
- Committee members include the chairman of the Curricular Governance Committee as well as pertinent members of the administration.
- Other changes in curricular management included the development of an Evaluation Subcommittee.
- Membership and responsibilities for the years one and two subcommittee were changed; the members include all block leaders and student representatives from both years one and two.
- The major charge to the subcommittee was adding the management of the schedule and curricular content for years one and two.
- The dean of the school of medicine established a new position and administrative office for the associate dean of undergraduate medical education, years one and two. Its purpose is to provide administrative support for implementing and maintaining the "new curriculum."
- Members of the Governance Committee for Undergraduate Medical Education include the dean of the medical school, who chairs the committee; the associate dean for undergraduate year one and two; the associate dean of student affairs; the associate dean for graduate medical education and undergraduate year three and four; the associate dean for faculty development; and the current chair of the curriculum committee.
- The curriculum committee members include faculty, medical students, and the associate deans.
- The current size of the curriculum committee is 15 plus ex-officio members and second-year students, and third-year students.
- The faculty composition of the committee is 50% basic science and 50% clinical.
- The charge to the committee is to advise the Curricular Governance Committee on:
    - policy,
    - evaluation (monitor),
    - scheduling, and
    - content (monitor).
- The Year One and Two Curriculum Management Subcommittee is composed of faculty, students, and ex-officio members, including the associate dean for student affairs, the associate dean for GME and years three and four, and the associate dean for faculty development.
- The charge to the committee is to monitor the schedule and content of the first and second years.
- The Year Three and Four Curriculum Management Subcommittee is composed of faculty, students, and the associate deans.
- There has been no immediate change in committee membership.
- The charge to the committee is to monitor the schedule and content of the third and fourth years.
- The Evaluation Subcommittee was created in July 1998, charged with designing a tool to evaluate the curriculum annually.
- This subcommittee develops and distributes and annual report.

Office of Education

- The Office of Medical Education at Medical College of Ohio has undergone much change in the form of growth over the past decade.
- It has grown from a "one-person" organization at the associate dean level to include the following areas, each led by an associate dean:
    - Year 1 and 2 Curriculum Management Office
    - Year 3 and 4 Curriculum Management Office
    - Standardized Patient Program Office
    - Testing Center for computer online administration of the NBME and proctoring of course exams
    - Academic Enrichment Center
    - Office of Faculty Development

Budget to Support Educational Programs

- Medical College of Ohio has always had a distinct budget for medical education.

- This budget funds the areas included in the Office of Medical Education.
- The funds for this budget are derived from state subsidy, tuition, and the MCO Foundation.

Valuing Teaching

- In January 1997, the dean of the School of Medicine created the position of assistant dean for faculty development. The position started as a half-time appointment but was quickly expanded (January 1998) to full-time.
- The first five-year plan (1997–2002) for the position included plans for (1) a formal faculty needs assessment, (2) quarterly school-wide faculty development seminars, (3) individual and department faculty development consultation, (4) a Teaching Scholars Fellowship Program, and (5) a New Faculty Academic Basic Training Program.
- In July 1998 the position of assistant dean for faculty development expanded again to a college-wide position, serving the School of Allied Health and the School of Nursing in addition to the School of Medicine.
- Four of the five initiatives listed above (1–4) have been implemented, with the New Faculty Academic Basic Training Program (5) to begin in the fall of 2000.
- In addition to these programs, a new "Resident as Teacher" Program was initiated in the summer of 2000.
- The Teaching Scholars Fellowship accepted its first class in the winter of 1999. Fifteen fellows were competitively chosen from applicants across the three schools (medicine, allied health, and nursing); they completed their year-long fellowship in December 1999.
- The 2000 fellowship classes are now in the middle of their fellowship training.
- Teaching Scholars are chosen for their commitment to teaching and have a special designation within the medical college.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The exit objectives for the School of Medicine are being revised.
- In the fall of 1998 a subcommittee was established by the Curriculum Committee to review and revise the current exit objectives.
- In the fall of 1999 a draft of the revised exit objectives was presented to the full committee; it is under consideration for adoption by the curriculum committee.
- Both current and revised exit objectives are available from the authors.

Changes in Pedagogy

- One of the salient features of the new curriculum for years one and two is a shift in the educational strategies such that there is a reduction in teacher-directed teaching and an increased emphasis on student-oriented and student-directed learning. Two discrete examples of this change are:
  - A 21% reduction in lecture time and a 20% increase in small-group time scheduled in years one and two.
  - Development of a pathophysiology course that spans years one and two, conducted in a problem-based learning format. This course emphasizes horizontal and vertical integration of disease processes. The educational objectives are designed to develop effective clinical reasoning and self-directed learning skills.

Application of Computer Technology

- Currently students are not required to have computers.
- The use of computer-based technology in the curriculum can be classified under three subheadings:
  - *Academic intranet*
    The MCO Academic Intranet is a resource for students, faculty, and staff as well as other MCO affiliates. Through the Knowledge Center (i.e., the intranet), users can view the structures of the curricula, courses, and topics, offered in the various schools.
  - *Development of supplementary academic material to be used in required courses*
    Faculty at MCO are encouraged to develop expertise in instruction that incorporates innovative technology to enhance student learning. This is accomplished with the support of the Center for Creative Instruction (CCI), which is housed on the MCO campus. The CCI's mission is to enhance the academic mission of MCO. The CCI creates projects using a team approach where faculty serve as the content experts while members of the CCI staff contribute their expertise as needed. Recently MCO has released the first in a series of CD-ROMs to be used for supplemental instruction when teaching anatomy; *Anatomy Revealed* uses state-of-the-art technology to "melt away" the

dissection of the skin and muscles to reveal the underlying nerves, vessels, and bones.

- *Computer-based testing*
  The assessment of medical students' basic and clinical science knowledge is changing from paper-and-pencil tests to computer-based systems. This is true for both professional licensure exams and assessments that occur regularly throughout the four-year curriculum. The Computer Testing Center administers the USMLE Step 1, Step 2, and Step 3 and the NBME subject examinations. Plans are being formulated to expand the testing center to include more stations, which will improve the possibility of using it during the first two years of medical school.

Curriculum Review Process

- In the spring of 1998 the new Curriculum Evaluation Subcommittee (CES) of the Curricular Governance Committee was formed. It was charged with designing a longitudinal assessment strategy able to measure the performance of the new integrated curriculum across the four years of medical school.
- The specific charge of the CES was to:
  - select the process and outcome measures to be monitored
  - monitor the collection and archiving of the data
  - pose evaluation questions/direct data analysis
  - request summary reports from the data manager
  - review and interpret the findings (at least annually)
  - provide periodic reports to the curriculum committee and to the Undergraduate Medical Education Governance Committee based on the findings (at least annually)
- The dean of the School of Medicine in April 1997 established the Curricular Task Force, composed of all of the chairmen of the basic science departments and chaired by the acting chairman of pathology and the chairman of pediatrics.
- The charge to the task force was to create a template for course restructuring to be used in designing the "new curriculum."
- The task force provided the requested template in June 1997 and, after general faculty approval of the proposed curriculum, the dean of the school of medicine established the Curriculum Implementation Committee in the fall of 1997.
- This committee was composed of team leaders for all of the new instructional blocks. The team leaders worked with the faculty over the next ten months to write content outlines and weekly schedules.
- The curricular changes were implemented for the class of 2002 in the fall of 1998.
- The key issues addressed in the curricular change are summarized below.
  - *Integration*. Substantive horizontal integration is a feature of the redesigned curriculum of years 1 and 2. Ten departmentally administered courses have been integrated and the content is now taught as seven interdisciplinary blocks. There is also substantial vertical integration of basic science and clinical science information built into the design of each instructional segment.
  - *Student-oriented instruction*. As part of the curricular design, there was an emphasis on reducing teacher-directed teaching strategies and on increasing student-oriented and self-directed learning.
  - *New pathophysiology course*. A new pathophysiology course was designed that combines independent study with case-based teaching in small groups. The course emphasizes horizontal and vertical integration, focusing on the mechanisms of the disease process in a problem-based setting. The educational objectives include developing an effective clinical-reasoning process, developing effective self-directed learning skills, and increasing student motivation for learning.

Future Challenges

- The major issues confronting the Curriculum Evaluation Subcommittee will be
  - to continue to monitor the progress of the inaugural class and all subsequent classes into their clinical experiences in the third and fourth years; and
  - to provide meaningful feedback loops so that quality improvement of the curriculum can be continuous.

Northeastern Ohio Universities College of Medicine

ALLEN C. SMITH III, PHD, JOHN D. ENGEL, PHD, AND JOSEPH AULINO, MS

Curriculum Management and Governance Structure

- The clinical departments draw on faculty from all of the hospitals in the consortium.
- A council with representatives from all hospitals governs each department.
- A structure of clinical councils and curriculum committees across the consortium was refined during the 1990s. Under the academic council, which has authority over the complete curriculum and faculty operations, a hierarchy of curriculum committees includes an overall committee and separate committees for various years.
- In 1999, the first- and second-year curriculum committees were merged to provide more direct opportunities for communication and integration.
- In 1999, the school organized a curriculum leadership group to maintain the initiatives developed within the separate committees, to integrate the ideas that arise at each level, and to promote continuing evaluation and research.
- The curriculum leadership group includes the chairs of the separate committees and of the task forces that managed the most recent curriculum review.
- Since 1995 there has been a student curriculum committee. It now includes the student representatives who are official members of the faculty committees, and brings together the students' concerns, ideas, and initiatives. The officers are members of the overall committee and of the academic council.
- The NEOUCOM student council (NSC) has taken a progressively more active responsibility to provide communication between students and the faculty and administration.
- The NSC has worked in conjunction with the student curriculum committee to address a variety of issues.
- Student representation is consistently incorporated into NEOUCOM's committee structure.

Office of Education

- The Office of Medical Education Research and Curriculum Development was established at the college in 1975.
- Its role and configuration have changed gradually, with a full emphasis now on direct support to course directors, faculty and curriculum committees, and task forces.
- The office is now called the Office of Academic Services and it manages and coordinates all curriculum and student schedules, administers all tests, and manages the curricular evaluation process.
- The Division of Academic Affairs has changed gradually. In 1990, there were four offices under the vice president and associate dean: academic services, student services, admissions, and the library.
- Under the vice president and executive associate dean, a new associate dean for student and academic affairs was established in 1995 with responsibility for academic services, student services, and a new Office of Professional Development.
- There are associate deans for admissions and institutional research and for information and education technology.
- Within the division of academic affairs there is a Center for the Study of Clinical Performance.
- A learning specialist was added to academic services in 1990 to assist students with more efficient and effective learning/study strategies. The specialist's role now also encompasses residents and physicians who need recertification.
- The Office of Professional Development was established in 1997 to address a range of issues identified as critical to student development. The office provides much traditional student affairs support but is progressively expanding its service in advising and counseling students.
- The office is also refining and expanding a system for assessing and promoting students' professionalism across the curriculum.

Budget to Support Educational Programs

- Specific line items in the budget are identified to support various aspects of the basic science and clinical education programs as well as faculty development.

Valuing Teaching

- First-year students select a Teacher of the Year.
- Second-year students select four Teachers of the Year from across the consortium.

- Teachers of the Year are recognized at major events, including orientation and convocation.
- Students select a faculty member who best embodies the qualities of humanism in medicine.
- Fourth-year students select faculty for a variety of honorary positions: commencement "hooders," grand marshall, class marshall, service to the class award, and class-day speakers.
- Faculty are selected into the Master Teacher program in a process that starts with nominations from the department councils and includes approval by the dean.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The Student Professional Development Advisory Committee was created in 1995 and charged by the dean to create a definition of and a means to access student professionalism.
- The virtues, qualities, and commitments of an outstanding physician were outlined and defined.

Changes in Pedagogy

- The college has progressively incorporated a mixture of problem-based learning activities across all six years of the combined BS–MD program.
- There are a community-oriented project in phase one, a PBL course in the first year of medical school, and PBL activities within the Introduction to Medicine course in the second year and within the third-year clerkships.
- Cases are used in various basic science courses, including biochemistry, neurobiology, and Principles of Medical Science.
- The "physician perspective" is incorporated in basic science classes by utilizing physicians in the actual teaching of basic science courses.
- Standardized patients are used in the first-year course in behavioral sciences, the second-year Introduction to Medicine course, and required examinations of clinical skills at the end of the second and third years.
- The process of integrating instruction across departmental lines and across years of the curriculum has begun. Beginning in 1999–00, there is a new one-month course on infectious diseases in the second year that combines material from several previous courses.
- The material has been integrated and the instructional design was developed to combine new approaches, including computerized cases, optional labs, and interactive lectures.
- Several first-year courses were integrated and blended in the 1998–99 academic year.
- Human Values in Medicine courses are offered across all four curricular years, with an emphasis in the fourth year.
- In the fourth year there is a new community medicine clerkship that has earned national recognition. Students work in small groups on a real problem in community health in collaboration with local experts in the community.
- The students produce proposals that are presented to community officials and that have been adopted and implemented in several instances.
- PDAT teams include a basic scientist and a clinical faculty member with six to eight students who work together the years of medical education until graduation.

Application of Computer Technology

- Currently, students are not required to have computers. The college makes computers available for student use through computer labs and the loan of laptop computers. Consideration is being given to requiring students to have computers.
- Computer technologies are applied and integrated in numerous ways throughout the educational program.
- All administrative support activities for the educational program have been extensively automated. This includes admissions, student aid, student testing and grading, and student records.
- Within the next three years, these functions will be further upgraded and integrated with all other college information systems.
- The faculty make extensive use of computer technologies in creating and delivering their course materials.
- The faculty use or have access to such tools as digitized analog/digital equipment for creating sound and video demonstrations and PC-based software for creating materials, including graphics/presentation software, Web publication software, scientific graphing software, and other commercially available packages.
- The college has established the Center for Academic Technology, where more advanced printing and software technologies are made available to the faculty.
- The two major teaching classrooms have been upgraded to support the integration of technology into the classroom.
- The college continues to provide Internet access, personal computers, audio and video recording/playback, and other technologies integrated with appropriate display devices in both major teaching classrooms.
- Students are expected to use computer- and network-based resources in support of the educational program.

- ◆ Students are expected to have basic proficiency in the use of standard office desktop computer skills and are expected to be able to use e-mail and discussion groups, to be able to search citation databases, scientific databases, and medical databases, and to be able to use the Web appropriately.

Changes in Assessment

- ◆ Following a continuous relationship for three years in the PDAT program, advisors draft the summary paragraph of the dean's letter for their advisees.
- ◆ Beginning in 1997, the professional development assessment form was incorporated as one component of the standard student evaluation process in the third-year clerkships. The project has expanded into the first two years of the curriculum and the results are now considered part of the academic review and promotions process.
- ◆ In 2000, a student portfolio program is beginning that will become an integral part of the advising process.
- ◆ In 1995, the school included a required clinical competency assessment at the end of the third year. This is a 16-case examination conducted in the Center for the Study of Clinical Skills that students are required to pass to graduate.
- ◆ In 1999, a clinical skills assessment was initiated at the end of the second year to examine the skills taught in the Introduction to Clinical Medicine course.
- ◆ In 1999–00 a clinical skills assessment was developed during the internal medicine clerkship using standardized patients.
- ◆ Quizzes and practice exams are utilized in the first-year basic science courses.

Clinical Experiences

- ◆ Beginning in 2000–01, first-year students will spend up to seven half-days in the ambulatory care experience (ACE) in conjunction with the behavioral science and Introduction to Clinical Medicine courses.
- ◆ The ACE experience will take place in a variety of settings, including hospital, clinics, and offices.
- ◆ An ambulatory care task force was organized in 1998 to propose the combination of programs to be implemented across the curriculum.
- ◆ The task force is working to consider places in all four years where students can gain increased experience in a range of outpatient settings.
- ◆ The task force will provide direction on the faculty development that must become an integral part of the program.

Curriculum Review Process

- ◆ Based on the most recent review of the curriculum, a set of issues was identified for ongoing review.
- ◆ Task forces were organized to continue the review and propose curricular adjustments.
- ◆ The educational program is guided by the college's strategic plan. The following strategic areas will be addressed in the next five years.
    - Prepare students to serve as practitioners and leaders in the evolving health care system.
    - Incorporate into the curriculum new courses and educational activities that emphasize the knowledge, skills, and experience required to succeed in the evolving health care system.
    - Develop a computer-assisted curriculum database for curriculum planning, using the AAMC's Curriculum Management and Information Tool (CurrMIT).
    - Include primary care and community health principles, problem solving, and case methods throughout the curriculum.
    - Provide opportunities for students to learn health care delivery in a variety of ambulatory and other nonhospital settings.
    - Provide educational opportunities for students to acquire skills in applying information technology to the learning process and to the care of patients.
    - Provide information channels necessary to support the mission in medical education, research, and service in medicine.
    - Develop a strategic information plan.
    - Strengthen the skills of students, faculty, and staff to apply technology in their work.

The Ohio State University College of Medicine and Public Health

RONALD COMER, PHD, JUDITH WESTMAN, MD, AND JAMES HOERSTRA, MD

Curriculum Management and Governance Structure

- The Executive Curriculum Committee (ECC) is responsible for the planning, design, implementation, evaluation, and oversight of the curriculum leading to the MD degree.
- Leadership and management of a coherent and coordinated curriculum are vested in the associate deans for medical education administration and for clinical education.
- Eight academic program directors, each chairing a faculty committee, are responsible to the ECC for organizing, implementing, and monitoring their portions of the curriculum.
- All academic program directors sit on the ECC, in addition to five at-large faculty, a basic science department chair, a clinical department chair, the academic review board chair, the associate deans for medical education administration and for clinical education, the director of academic services, and two students.
- Recommendations for major curricular change are submitted by the ECC to Faculty Council for approval with the concurrence of the Council of Chairs.

Office of Education

- The Office of Medical Education was established over 30 years ago.
- For many years the associate dean for medical education was responsible for educational leadership and direction of the curricular programs.
- Recently, two associate deans, the associate dean for student affairs and medical education administration and the associate dean for clinical education and outreach, share responsibility for the office of medical education.
- Staff support to the academic program directors and budget support for implementation of the curriculum are administered through this office.

Budget to Support Educational Programs

- The Office of Medical Education has an annual budget allocated by the dean of the College of Medicine and Public Health.
- The budget consists of a combination of state funds, student tuition funds, and "dean's tax" funds resulting from clinical practice income.
- The budget is further allocated to each of the eight academic programs, the Office of Academic Services, and Admissions and Student Affairs.
- Increasingly, some limited funds for building renovation and refurnishing are also being allocated to the Office of Medical Education to improve the physical infrastructure necessary for a high-quality medical education program.

Valuing Teaching

- Teaching awards are presented annually.
  - Students elect faculty winners.
  - Plaques are presented at convocation.
- Excellence in Medical Education Awards (including cash awards) are presented annually.
  - Nominations are collected from chairs, affiliated hospitals, and faculty.
  - Winners are elected by a faculty committee.
  - Plaques are presented at an Annual Community Preceptor Banquet and at departmental faculty meetings.
  - Acknowledgements are included on a "Wall of Excellence" (under construction).

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The clinical curricular reform initiative, fully implemented during 1999–00, defined ten goals for the MD curriculum and several hundred learning objectives for clinical education.
- The basic science lecture/discussion curriculum is currently in the process of reform.
- Preclinical curricular options have defined learning objectives as follows.
  - The Independent Study Pathway curriculum option

  (preclinical) includes detailed learning objectives for each module.
  - The problem-based learning curriculum option (preclinical) uses student-defined learning objectives.
  - The lecture/discussion curriculum is currently being reformulated.
- The new clinical curriculum is in its first year of full implementation.

Changes in Pedagogy

- Preclinical students have a choice of three curricular tracks, independent study (ISP), problem-based learning (PBL), and lecture/discussion.
  - ISP students have a time-variable curriculum.
  - ISP students take exams when they feel they have mastered the modular learning objectives. They do not participate in classroom instruction.
  - The ISP curriculum uses some cases and a considerable number of computer-based tutorial programs.
  - PBL students meet regularly in small groups of seven students and two faculty over the first two years of medical education.
  - The PBL curriculum is entirely case-based.
  - PBL students take scheduled examinations customized to accommodate the variability in topics covered across groups.
  - Lecture/discussion students attend classroom presentations, often in large-group settings.
  - The lecture/discussion curriculum is currently being redesigned to increase the use of small-group discussions, some of which will be case-based.
- Standardized patients are used intermittently with all students during the Doctor–Patient Relationship course, during the physical examination course, and for the third-year OSCE.

Application of Computer Technology

- At this time, students are not required to have their own computers, but are encouraged to do so.
- Class surveys indicate that almost 75% of the class have access to computers at home.
- Nearly 90 computer workstations conveniently located on the medical school campus provide students with up-to-date computer technologies and Web accessibility.
- Computer technology is used throughout the four-year educational program.
- All students have e-mail addresses. Much of the administrative communication with students is via electronic mail.
- The Independent Study Pathway uses a series of tutorial programs for students to self-evaluate their knowledge prior to taking module examinations.
- During the first year, computer-based programs are used extensively in gross anatomy, neuroscience, and histology.
- Annotated gross and histopathologic images are available in a Web-delivered format for students in the second year.
- Computer-based resources are used in cardiology, neurology, and ophthalmology during the second and fourth years.
- A new initiative is under way to develop Web-based physical examination educational materials.
- Students use Web-based course registration.
- Third- and fourth-year clerkship scheduling is completed via the Web.

Changes in Assessment

- Faculty observation of student history and physical exam skills has historically been required during the Doctor–Patient Relationship (DPR) course, the physical examination course, and the general clerkship.
- Obtaining faculty compliance has not been a problem in the DPR course, but has been a challenge during the physical exam course and the general clerkship.
- Faculty development and orientation workshops, sensitizing clerkship directors and hospital representatives to the need for compliance, and requiring students to obtain their evaluation forms for the witnessed history and physical have all been somewhat successful in improving this process.
- The use of student logs of clinical activity has increased over the past several years.
- Most recently, the ambulatory clerkship is using student logs to document the range of patient problems encountered on the family medicine and internal medicine rotations.
- The logs are used both to monitor student clinical activity and for ongoing evaluation of the ambulatory experience.
- The use of an OSCE following third-year clerkships in pediatrics, internal medicine, and psychiatry/neurology was implemented during academic year 1999–00.
- The ten-station OSCE is designed to examine a sampling of critical clinical skills spanning these clinical domains. Currently this project is considered a pilot to determine feasibility and viability.

Clinical Experiences

- Students are matched with preceptors in hospitals and in clinical offices throughout the four years of medical education.
- First year—all students complete a clinical preceptorship that includes, at minimum, eight three-hour ambulatory office experiences that provide opportunities to practice interviewing and history-taking skills.
- PBL students take their physical examination course during this year, which also includes outpatient history and physical exam experiences.
- Second year—lecture/discussion and ISP students complete their physical examination course, which includes learning experiences in hospital and in ambulatory clinical environments.
- Third and fourth years:
    - Third-year students take a required 12-week ambulatory clerkship with 4.5 days each week in ambulatory clinic environments.
    - Several other clerkships during the third year involve both ambulatory clinic and hospital ward settings.
    - Fourth-year selectives and electives are both clinic- and ward-based.

Curriculum Review Process

- A major curricular reform effort was initiated in 1996 to redesign the clinical curriculum and to be followed by a reformulation of the basic science curriculum.
- The dean charged a curriculum committee:
    - to develop new learning objectives for clinical education;
    - starting with a zero base, to define core clinical learning experiences, including first-, second-, third-, and fourth-year experiences and any longitudinal experiences; and
    - to define emphasis programs in primary care and other specialties.
- A comprehensive review of the literature was conducted, existing objectives (available at Ohio State and from elsewhere) were analyzed, and academic leaders, faculty, and students were interviewed.
- Progress was regularly reported to standing committees and during general faculty meetings. Curriculum committee meeting minutes and draft reports were kept up-to-date on the Web for all faculty and students to access.
- After the final committee report was approved by the ECC, clerkship task forces were appointed to plan the details of implementation and evaluation. A year of transition and then the current year of full implementation followed this process.
- Reform of the preclinical curriculum is currently under way.
- Program review is an ongoing process.
- Each of the curricular tracks and academic programs has substantial program-evaluation systems to monitor the educational program.
- Regular evaluation reports are generated based on student feedback.
- Faculty and student representatives on the academic program committees and module directors provide ongoing review.
- Each academic program is required to provide an annual report to the ECC documenting the previous year's achievements and presenting planned change for the coming year.

Future Goals and Challenges

- Providing clinical education in the midst of economic change
- Funding faculty to teach, as their primary responsibility
- Curriculum reform of the basic science years
- Implementation of additional clinical education in the preclinical curriculum
- Definition and development of a clinical skills training facility

Wright State University School of Medicine

ALBERT LANGLEY, PHD

Curriculum Management and Governance Structure

- The educational program is managed centrally by a 13-member curriculum committee.
- The members of the committee are chosen from constituencies that include basic science departments, clinical departments with clerkships, clinical departments without clerkships, and students.
- Nine members are elected and four are appointed by the dean.
- The dean chooses the chair, who reports to the associate dean for academic affairs.
- Prior to 1997 all of the courses and clerkships in the curriculum were controlled entirely by individual departments.

Office of Education

- The Office of Educational Development and Evaluation (OEDE) was established in 1994.
- The OEDE analyzes all examinations and administers and analyzes all student evaluations of instruction.
- An educational support unit, Interdisciplinary Teaching Laboratories (IDTL), was established in 1976.
- The main change in the scope of the IDTL responsibilities has been in its support for the development and implementation of technology-based instruction.

Budget to Support Educational Programs

- A budget for education was identified in 1994 and is funded from core state dollars and several endowments.

Valuing Teaching

- There is not a formal faculty development program. Faculty development workshops are developed and implemented on a "just-in-time" basis as needed.
- There is no special designation for faculty heavily involved in education.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school has established learning objectives for the medical student education program.
- The objectives are organized into 12 Guiding Principles for Education:
  - Establish and maintain high standards of excellence
  - Create a positive environment for learning
  - Develop a primary care orientation with understanding and appreciation of specialty training and practice
  - Incorporate a humanistic approach to patient care
  - Develop the skills to assess and view the whole patient (in the context of self, family, community)
  - Develop in students the tools to be lifelong learners
  - Include a broad base of educational experiences to enable students to make informed career decisions
  - Establish a belief in and an understanding of the value of health promotion and disease prevention
  - Create in students a confidence in their own knowledge and abilities
  - Establish a solid foundation in biomedical, behavioral, and humanistic science
  - Develop appropriate professional attributes and responsibilities
  - Create a clear understanding of the environment in which future physicians will practice
- There is a Competency List for Medical Students (available from the author) that covers:
  - Collaboration
  - Communication
  - Attitudes
  - Cultural awareness
  - Patient evaluation
  - Cognitive abilities
  - Problem-solving
  - Procedures
  - Management
  - Information gathering

Changes in Pedagogy

- The students are exposed to clinical cases much earlier, to reinforce the clinical relevance of the basic science courses.

- There is an emphasis on case-based learning.
- There is an emphasis on evidence-based decision making.

Application of Computer Technology

- Students are required to own computers.
- All courses use computer-based instruction, including multimedia presentations.
- Evidence-based medicine projects require literature searches.

Curriculum Review Process

- There is in place a system for continual review and assessment of the curriculum.
- The curriculum was converted from a discipline-based departmentally managed curriculum to a basic science/clinical science integrated curriculum that is centrally managed.
- The school is in the third iteration of the first-year curriculum; the second iteration of the second-year curriculum; and the first iteration of the third-year curriculum. The new fourth-year curriculum will be implemented in the fall of 2000.

Challenges

- The major barrier is the logistics of managing a four-year education program from a single office. It is necessary to have individuals to oversee different components of the curriculum, in order to bring it all together.
- The major issues relate to:
  - continuing the development of community-based training sites;
  - greater use of computer technology, both as an educational tool and as an evaluation instrument; and
  - greater application of a competency-based assessment system using standardized patients and OSCEs.

University of Oklahoma College of Medicine

M. DEWAYNE ANDREWS, MD

Curriculum Management and Governance Structure

All students (150 per class) take their first two years of medical school at the college's main campus in Oklahoma City. In the third year, approximately 30 students annually elect to take the last two years at the clinical branch campus in Tulsa. The educational program for both campuses is under one governance and management structure.

- Prior to 1997, the college had a single medical education committee that was large, cumbersome, and somewhat stale in its approach to assessment, evaluation, management, and innovation in the curriculum. Since 1997, significant changes in curricular integration, planning, and evaluation have occurred. Now the undergraduate educational program oversight and management is vested in three committees:
  - The Basic Science Curriculum Committee (BSCC) has responsibility for the first and second years, which includes significant early and continuing experience with patient contact and clinical skills development.
  - The BSCC membership includes all course directors for the first two years, elected student representatives from the first and second years, and ex officio members from the dean's office; the committee is chaired by the senior associate dean for academic affairs.
  - The Clinical Sciences Curriculum Committee (CSCC) has responsibility for the third and fourth years.
  - The CSCC membership includes all core clinical clerkship directors (Oklahoma City and Tulsa); the faculty directors for the required fourth-year ambulatory medicine clerkship; the faculty director for the required rural preceptorship; three members appointed by the faculty board representing a surgical subspecialty, a non-surgical subspecialty, and a hospital-based specialty; one member of the volunteer faculty; elected student representatives; and ex officio members from the dean's office. The committee is chaired by the senior associate dean for academic affairs.
  - The Curriculum Coordinating Committee is a small group of individuals selected from the BSCC and the CSCC who meet occasionally to monitor the progress of the BSCC and CSCC; to ensure appropriate integration; and to serve as a "think tank" group for long-term direction and strategy.

Office of Education

- Historically, support for the educational program, faculty, and administration of the curriculum was provided through individual departments and the dean's office.
- In 1996, the executive dean created the position of senior associate dean for academic affairs, which led to the consolidation of a number of support functions.
- Two new roles have been created: associate dean for medical education and associate dean for educational assessment and informatics.
- In 1999, the College created the new Office of Educational Development and Research.
- The director of the Office reports to the senior associate dean for academic affairs.

Budget to Support Educational Programs

- The college receives discrete state funds targeted for support of education.
- The funds are derived from tax dollars and are appropriated annually by the legislature.
- The college receives tuition dollars.
- Clinical departments and the college fund some aspects of the educational programs through clinical practice revenue.
- A new project has been initiated to develop cost accounting for the educational programs as part of a move to mission-based budgeting.

Valuing Teaching

- Faculty recognition includes
  - teaching evaluations and accolades
  - annual Aesculapian nominations and awards given by students for outstanding teaching
  - the annual Stanton L. Young Master Teacher Award, which carries a $10,000 cash prize

- special awards and professorships granted by the board of regents of the university to recognize sustained, outstanding teaching and/or service to education

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In late 1996 and early 1997 there were educational strategic planning retreats involving many faculty, students, and the administration of the college.
- New educational program objectives were established with corresponding outcome measures/indicators.
- The faculty board approved the objectives in March 1997 and they have been used to guide the educational planning and implementation efforts since that time.
- In the fall of 1998, another educational planning retreat was held in which many faculty education leaders and student representatives participated.
- The educational program objectives were reviewed, their utility discussed, and some amendments made. [An elegant chart of the educational objectives and their corresponding outcome measures/indicators is available from the authors upon request.]

Changes in Pedagogy

- Small-group discussion (module teaching) has always been of primary importance in basic science years.
- The basic science education building was designed to accommodate the modules.
- There is increased use of interdisciplinary teaching using clinicians and basic scientists together.
- A case-based approach to small-group studies is used in the basic science years.
- There are increased numbers of problem-based applications; these occur in the second year.
- Student-centered learning is a critical part of a course called Professional Ethics and Professionalism, with students selecting the course content, meeting in small groups with faculty and community facilitators, and making presentations to classmates.
- Since 1990 standardized patients have been used in the Principles of Clinical Medicine course in the first and second years.
- The standardized patient program is being expanded to include cultural diversity exposure; a family is being "trained" to allow student observation of the family dynamics in the Native American culture.
- All standardized patients are trained to provide appropriate assessment and feedback.

Application of Computer Technology

- Since 1997 students have been required to own modern computers upon entry to medical school.
- Upon matriculation, every student is given a campus computer account for access to e-mail, central server space, and dial-up Internet connectivity.
- A centralized Web site (⟨hippocrates@ouhsc.edu⟩) provides students with on-line educational resources, including lecture slides, multimedia tutorials, quiz banks, video clips, and animations.
- Students may access their class schedules on-line and download them for use on personal hand-held computers.
- Current clinical materials include clinical calculators, obstetrics, case presentations, and information regarding various procedures.
- Links are provided to the library's on-line journals and reference tools and to external Web sites such as those of ERAS, FREIDA, the NRMP, and the USMLE.
- Instructors employ computers during both laboratory sessions and lecture presentations.
- Faculty use discussion boards to deliver class announcements and post answer keys after examinations.
- Course directors offer anonymous on-line course evaluations to gather information about their courses.
- A state-of-the-art fiberoptic network provides students access to curricular resources.
- Each major lecture hall is equipped with a lecturer workstation and an LCD projector.
- Plans are under way to improve students' access to computers in campus hospitals and clinics.

Changes in Assessment

- The primary means of assessment in the basic science courses are multiple-choice examinations and practical examinations to identify specific structures in the anatomy course.
- At present, computer-based examinations are not used. With the implementation of computer-based examinations for Steps 1 and 2 of the USMLE, serious consideration is being given to using the computer format for other examinations.

- In the clinical years, students are assessed utilizing
  - faculty attendings' and residents' written evaluations on clinical clerkships, using a standardized form
  - NBME subject examinations
  - seminar/symposium presentation assessments
  - internally developed examinations, written and oral
- The CSCC is exploring the feasibility and implementation strategies necessary for an OSCE to be administered near the end of the third year.

Clinical Experiences

- Students begin clinical experiences early in the first year with standardized patient interviews and regularly scheduled experiences in community physicians' offices.
- Students begin work with "senior mentors," who are elders in the community who have agreed to work with the students over time to assist them in understanding the special needs of the geriatric population.
- In the second year, students are assigned to clinical preceptors, both in hospital units and in community physicians' offices, where they examine real patients, write up their experiences, and review them with their preceptors.
- The third year consists primarily of core clinical clerkships that provide a variety of learning venues, including inpatient hospital units (University, Childrens, VA, and some private community); outpatient hospital-based clinics, outpatient clinics in freestanding ambulatory care centers, and physicians' offices.
- The fourth year includes a required ambulatory medicine clerkship and a required rural preceptorship (both office and hospital experiences).

Curriculum Review Process

- Faculty have been involved in a review of the curriculum for the past several years.
- Two faculty retreats generated recommendations and included a process of course review involving faculty, students, and course directors, with appropriate feedback to all.
- In addition to two curriculum committees, a curriculum coordinating committee meets biannually to discuss the direction, structure, and approach to new curricular design. Such discussions have resulted in the development of longitudinal curricular topics. To date these include
  - complementary and alternative medicine (taught in a seminar series in the third year)
  - palliative care (surveys of students, presentations in existing courses, and incorporation into clinical clerkships)
  - domestic violence
  - professional ethics
  - evidence-based medicine (longitudinal experiences with assignments in biostatistics and epidemiology, physiology, human behavior, and ethics)
  - family-centered care activities (incorporated in the curriculum and in student organizations)
  - a new Patient, Physician, and Society program that includes medicine and literature and medicine and law experiences (under development)
- Ongoing review of the educational program is the responsibility of the associate dean for educational assessment and informatics.
- A standardized course-evaluation process for the basic science curriculum has been in place for a number of years. Students are requested to complete a computer-based evaluation form for each course. Students also have the opportunity to provide written comments about the course on the evaluation form. These data are collated by the associate dean and sent to the course director.
- The course directors and the associate dean meet with a representative group of students to discuss each course in detail. The course director then prepares a report and submits it to the Basic Sciences Curriculum Committee. The committee reviews these data and makes recommendations to the course director.
- At present, the course directors of the required clerkships submit to the Clinical Sciences Curriculum Committee a report that describes their course in detail in a standardized format. The major goal of this process is to ensure comparability of the educational experiences between clerkships on the Oklahoma City and Tulsa campuses.
- An evaluation process similar to that employed in the basic science curriculum is being designed for student evaluation of the third-year required clerkships. This was expected to be implemented in July 2000.

Future Goals

- The major issues that will be addressed in the next five years include:
  - implementation of a comprehensive course-evaluation process for the required clinical clerkships

- continuation of efforts to reduce the number of lecture hours in the basic science courses and increase integration of material and the number of small-group activities
- increased utilization of problem-based-learning experiences
- continuing evolution of computer-assisted instruction
- enhancement of faculty teaching skills

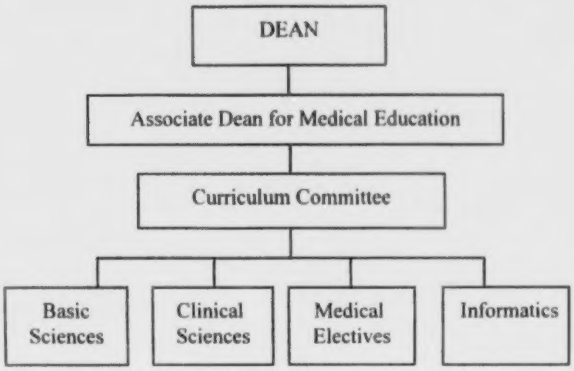
Oregon Health Sciences University School of Medicine

EDWARD KEENAN, PHD, VICKI FIELDS, KAREN DEVENEY, MD, J. S. REINSCHMIDT, MD, AND JOSEPH BLOOM, MD

Curriculum Management and Governance Structure (See Figure 1)

- The revised curriculum is supported by centralized governance in the dean's office through the Office of Education and Student Affairs.
- Prior to revision, the curriculum existed with minimal administrative support, curricular infrastructure, or guiding rationale.
- The curriculum committee and its subcommittees are responsible for implementation, evaluation, coordination, and continuous evolution of the revised curriculum.

FIGURE 1: Curriculum Governance Structure



Budget to Support Educational Programs

- Grant funding facilitated the curriculum revision.
- Permanent funding was identified by the dean to replace external funds.

Valuing Teaching

- A faculty database was developed to document teaching.
- The school developed a formula to delineate teaching effort by departments.
- The school established salary bonuses allocated to departments based on a teaching-effort formula.
- A Peer Teaching Award program was developed to expand recognition of faculty as teachers, innovators, mentors, and scholars in medical education.
- Promotion and tenure policy revised to provide equity regarding contributions of teaching, research, clinical care, and service toward academic advancement.

CURRICULUM RENEWAL PROCESS

- Rationale for curricular revision
  - Need to address new information and education for the future
  - Need to minimize redundancy and identify content deficiencies
  - Need to enhance relevance and teaching methods
  - Need to establish process for continuous curricular enhancement
- Goals of curricular revision
  - Develop a four-year medical curriculum with a rational sequence of knowledge acquisition integrating the basic and clinical sciences with a reinforcing early clinical experience
  - Enhance the processes by which medical students acquire the knowledge, skills, attitudes, and values requisite for physicians in a rapidly changing health care milieu, including enhanced emphasis on professionalism and humanism
  - Provide more educational opportunities in the ambulatory care and primary care settings that more realistically reflect clinical practice
- Curricular principles guiding revision
  - Centralize responsibility for curriculum in the dean's office
  - Foster independent learning and promote investigative and problem-solving skills
  - Better address societal and behavioral issues in health care
  - Establish an early longitudinal clinical experience
  - Require transition experiences at strategic curricular junctures
  - Organize basic sciences curriculum as a continuum
  - Delineate core clinical curriculum in the third year

  - Make faculty responsible for defining course content
  - Establish criteria for faculty academic advancement to assure equity and balance of teaching with research, patient care, and service
- Characteristics of former curriculum
  - The curriculum before the revision was a traditional department-based curriculum with 24 courses comprising years one and two.
  - The preclinical courses were lecture-intensive, with minimal independent study time.
  - Students had very limited patient care opportunities during the preclinical years.
  - The clinical curriculum was inpatient-based and lacked longitudinal objectives.
  - Bridging or transition courses were lacking at critical intervals.
  - Performance-based assessment of students was absent.
- Timeline for curricular revision
  - Analysis phase 1988–90
  - Development phase 1990–91
  - Implementation phase 1991–94
- Revised curriculum structure
  - Year one
    —Transition to medical school
    —Gross anatomy, imaging, and embryology
    —Cell structure and function
    —Systems processes and homeostasis
    —Biological basis of disease
    —Principles of clinical medicine and preceptorship
  - Year two
    —Circulation
    —Metabolism
    —Neurosciences and behavior
    —Blood
    —Human growth and development
    —Principles of clinical medicine and preceptorship
    —Transition to clerkships
  - Year three
    Core Unit A: six-week clerkships
    —General internal medicine
    —Family medicine
    —Pediatrics I
    —Ob–gyn
    Core Unit B: six-week clerkships
    —Internal medicine
    —Surgery I
    —Psychiatry
    —Rural primary care
    Continuity Curriculum Seminars
  - Year four: four-week clerkships
    —Surgery II
    —Pediatrics II
    —Neurology
    —Subinternship or ICU
    —Electives
    —Transition to residency
- Highlights of the revised curriculum
  - Centralized responsibility
  - Integrated and multidisciplinary basic science courses with enhanced clinical relevance and logical sequencing
  - Lecture and non-lecture learning balanced in half-day sessions
  - Education based on instructional objectives
  - Early and longitudinal clinical preceptorship
  - Core clerkships completed during third year
  - Ambulatory and primary care strongly emphasized
  - Primary care clerkships linked sequentially
  - Required clinical experiences in a rural and/or medically underserved area
  - Continuity curriculum in the third year
  - Advanced clerkships in the fourth year
  - Transition courses bridge curriculum
  - Performance-based assessment of students using standardized patients
  - Internet-based courses and curriculum evaluation

Curriculum Review Process

- Required courses/clerkships are evaluated annually and reviewed by the Curriculum Committee.
- The students' USMLE performances are analyzed.
- Performance-based assessment of students is required during the first, second, and third years.
- The performances of graduates are assessed by surveying residency program directors.
- Responses to the AAMC Graduation Questionnaire are monitored.

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*Note: The authors are indebted to the late J. S. Reinschmidt, MD, for his wisdom and vision as a chief architect of our curriculum reform.

Jefferson Medical College of Thomas Jefferson University

SUSAN RATTNER, MD

Curriculum Management and Governance Structure

The Jefferson Medical College of Thomas Jefferson University, founded in 1824, is part of a free-standing health science university with a graduate school and a college of health professions. Changes since 1990 include:

- The university separated from the university hospital; the hospital merged into a regional network of affiliated acute care and non–acute care institutions.
- The Office of the Dean reorganized its academic affairs and affiliations offices into a single unit that oversees undergraduate, graduate, and continuing medical education.

Office of Education

- The Center for Research in Medical Education and Health Care (formerly the Office of Medical Education) was established in 1969. Changes since 1990:
  - There has been increased involvement in national educational assessment projects, most recently in the area of the impact of managed care on medical education.
  - The center is responsible for evaluation and feedback for courses and clerkships (test grading, evaluation support, maintenance of test question databanks, and test and evaluation development).
  - In collaboration with clerkship directors, the center supports annual affiliation meetings to review student progress and satisfaction data with all clinical sites
  - The Longitudinal Study at the college has been expanded to include data about alumni of Jefferson residency programs.
  - The Clinical Encounter Project has been developed to track educational and patient care data for third-year clerkships in family medicine, pediatrics, and internal medicine. There are currently over 150,000 encounters in the system. Tracking in surgery, obstetrics–gynecology, and psychiatry and human behavior is scheduled for implementation in July 2000.

Budget to Support Educational Programs

- Funding from the dean to each department is based on support of medical student education.
- Increased funding has been allocated for clinical departments now more involved in teaching in the first two years.

Valuing Teaching

- There are new departmental and college awards:
  - teachers of the year (two individuals selected from all faculty who teach in the years one and two)
  - award with honorarium for teaching in the microbiology second-year course
  - departmental recognition for residents for student teaching
- Publication of research in medical education in peer-reviewed literature is regarded as comparable to peer-reviewed biomedical publication in faculty promotion.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Using the AAMC's MSOP and Jefferson's Longitudinal Study, a review is being conducted of the objectives of Jefferson's undergraduate medical education program.
- A concurrent review of the educational infrastructure, including space, technology, and personnel, is linked to this effort.

Changes in Pedagogy

- Case-based learning has been incorporated into all basic science courses to increase emphasis on patient-centered learning.
- During the first year, behavioral medicine is taught with interviewing and history-taking skills by interdepartmental faculty and co-directed by psychiatry and family medicine.
- During the second year, physical diagnosis has been expanded to include new lectures, new simulation technology, and additional supervision of basic skills.
- Problem-based learning has been incorporated into several courses and clerkships.
- CD-ROM resources are in use as supplemental resources.
- "Teaching to teach" educational programs have been incorporated into the residency curriculum in support and

recognition of the importance of the housestaff in student education.

Application of Computer Technology

- Medical informatics was introduced as a requirement for all first-year students in 1992.
- Computer-based testing was introduced in 1991 for the surgery clerkship examination and in 1996 for microbiology.
- Educational materials (including schedules, course information, and syllabi) are available on the Web.
- CD-ROMs have been developed as supplementary materials for microscopic anatomy, pathology, and infant history and physical examination.
- Advanced medical simulation is available for teaching critical care skills.
- E-mail is used for distribution of course grades and most student information.

Changes in Assessment

- Course and clerkship examinations have introduced an uncued multiple-choice format.
- Brief structured clinical observations and video reviews have been put into pediatrics clerkship experiences.
- Clerkship practical examinations have been standardized.
- Clinical clerkship evaluation forms have been refined.

Clinical Experiences

- Students are in physicians' offices from the beginning of the first year.
- Approximately 38% of the clinical experiences of the third and fourth years are office-based; 44% are in the primary care specialties.
- In obstetrics and pediatrics electives are available in which first-year students are partnered with the patient/family for a year.
- There are opportunities for volunteer and elective experiences in the care of homeless men and women/children for all students. More than half of the students participate, including most of the first-year students. In the fourth year, 20–40 students assume leadership roles.
- Community-based care in the home, skilled nursing facilities, and prisons are included on clerkship experiences.
- Content related to "managing care" from the health system perspective is incorporated into the clinical curriculum of the third and fourth years.

Curriculum Review Process

- During the 1994–95 academic year, a review of curricular content and scheduling in the first and second years was conducted.
- The theme of this effort was to assess relevance of content to current medical practice and adequacy of preparation for clinical clerkships.
- The review process was supported by the dean and included basic science and clinical faculty.
- Outcomes of the process included a redesign of the second year, increased "patient-centered" focus in both years, and expansion of clinical skills training as well as patient care electives in the first two years.
- Funding for these efforts came from grants and internal sources.
- During the 1999–00 academic year, outcome goals for graduation and the educational infrastructure were reviewed.
- The Curriculum Committee reviews all courses and clerkships over a two-year cycle.
- The committee includes student members from each year.

Future Goals

- Major issues over the next five years include:
    - assuring an appropriate patient base for education of students
    - the development of evaluation and supplementary learning experiences by application of simulation technology
    - implementation of curriculum designed in the current review process

MCP–Hahnemann School of Medicine

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BURTON J. LANDAU, PHD, AND THEODORE R. KANTNER, MD

Curriculum Management and Governance Structure

- The school has implemented institutional management to achieve a well-coordinated coherent curriculum based on principles of adult learning.
- Management of the four-year program is vested in a faculty committee known as the Educational Coordinating Committee (ECC) with strong support from the Office of Educational Affairs.
- The ECC is responsible for coordinating graduate medical education and continuing medical education.
- The ECC is chaired by a faculty member appointed by the dean and includes faculty (not from prescribed departments) who are appointed by the dean; four students, and ex officio members from various divisions of the Office of Educational Affairs.
- The ECC reports to the Executive Committee of the Faculty and receives direction from the dean.
- The ECC is supported by standing committees and ad-hoc subcommittees.
- Course directors are members of the Year One and Year Two, clerkship directors are members of the third- and fourth-year subcommittees of the ECC.
- Two curricular paths are offered in the first two years of the educational program. The Program for Integrated Learning (PIL), a problem-based learning curriculum introduced in 1992, uses small-group learning and clinical case-based problem solving. The Interdisciplinary Foundations of Medicine (IFM) curriculum, introduced in 1997, is integrated across disciplines, utilizing clinical symptom presentations.
- Each student selects a path based on his or her own learning style.
- Both curricula are provided support by the Office of Educational Affairs and its Division of Medical Education.

Office of Education

- The Office of Educational Affairs (OEA) has responsibilities for undergraduate, graduate, and continuing medical education and biomedical graduate programs and was established originally in the 1970s.
- The OEA is directed by the vice dean for educational and academic affairs.
- The OEA is responsible for several interdepartmental courses.

Budget to Support Educational Programs

- There is a discrete budget to support the educational programs.
- Educational programs are supported through direct allocations from the dean to academic departmental budgets for teaching activities.
- The dean's budget supports the OEA and its associated activities.

Valuing Teaching

- Each department has identified at least one faculty member whose primary responsibility is to direct the course(s) and clerkship(s) offered by the department.
- Faculty are recognized by awards such as the Lindback Award, and the Golden Apple Award for exemplary teaching.
- The quality and quantity of participation in educational programs are important in promotion and tenure as well as salary determinations.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The Medical College of Pennsylvania had exit objectives in place in 1993 when it merged with Hahnemann University. The objectives have been adopted by the merged entity MCP Hahnemann School of Medicine.
- The exit objectives have been reviewed recently through the ECC and modified to accommodate increased need for proficiency in such areas as information technology.

- Achievement of outcomes is determined in a number of ways, including evaluation as a self-directed learner; discipline-based written and oral examinations, faculty observation of clinical skills (standardized patients), scores on USMLE Steps 1 and 2; scores on NBME subject exams in all third-year clinical courses; and a clinical skills exam in the fourth year required for graduation.
- The list of outcomes is available from the author.

Changes in Pedagogy

- Students may choose between the IFM and PIL curricular tracks for their first two years of study.
- In the third year, all students spend at least one third of their clinical experience in an ambulatory setting.
- Medicine, surgery, obstetrics–gynecology, and pediatrics have achieved an appropriate balance between inpatient and outpatient instruction. Family medicine is an all-ambulatory experience.
- The fourth-year curriculum is based on a Pathway System initiated in 1997. The system was developed to allow the student to concentrate in a specific discipline while providing a broad general professional education and improving the advisory/career-counseling process.
- Students interact with patients in the Barbara E. Chick Clinical Educational and Assessment Center (CEAC). Students see standardized patients in the CEAC's ten examining rooms.

Application of Computer Technology

- Effective August 2000, all incoming students are required to have personal computers.
- The exit objectives include "the ability to utilize information technology to enhance ongoing learning, professional development, and continuing clinical competence."
- Computers, multimedia technology, and the Internet allow students to augment the information and skills learned from classes, print materials, and clinical rotations.
- Faculty have developed interactive learning tools ranging from biochemical exercises to simulated patients presenting ethical dilemmas.
- Lecture handouts and lab manuals are increasingly available on the Web.

Changes in Assessment

- A state-of-the-art, clinical skills learning laboratory using standardized patients enables assessment of students' progress through the four-year curriculum.
- Students are assessed using computers in a medical ethics program MedEthEx.
- There is a third-year psychiatry–ethics OSCE during the psychiatry clinical clerkship.

Clinical Experiences

- Every first- and second-year IFM student spends four afternoons in a community-based, primary care physician's office. Every PIL student spends nine weeks between years one and two working in a community-based physician's office.
- During the second year, a PIL student spends approximately 60 hours in a community-based physician's office learning the fundamentals of physical diagnosis. An IFM student learns the basics of physical diagnosis in the inpatient setting.
- In the third year, students are provided with a broad clinical experience in family medicine (six weeks), medicine (12 weeks), surgery (12 weeks), pediatrics (six weeks), psychiatry (six weeks), and obstetrics–gynecology (six weeks).
- In the fourth year, students select clinical electives based on their pathway choices.

Curriculum Review Process

- In 1995, the dean of MCP/Hahnemann charged a faculty committee reporting to the ECC with the development of a new curriculum that integrated basic sciences in a clinical context.
- In 1997, the IMF curriculum was implemented with these guiding precepts:
  - Establishing a logical, integrated, and aligned sequencing of functional systems based on learning objectives developed by faculty
  - Using clinical cases as a contextual framework to accomplish the learning objectives
  - Building on previous constructs (in blocks) with sequential objectives
  - Reinforcing concepts without being redundant
  - Including the following topics in all blocks and illustrative cases:

  —basic science
  —critical thinking/decision making
  —developmental stages
  —doctor–patient interactions
  —ethics
  —impacts of illness on patient, family, community, and society
  —population-based medicine/biostatistics/epidemiology/health care economics
  —professionalism
  —roles of gender, ethnicity, age
  —societal/environmental roles in illness
  —promotion of disease prevention
- linking evaluation to achievement of goals and objectives

◆ These concepts led to the design and implementation of the IFM curriculum.

◆ The responsibility for curricular and student evaluation resides with the appropriate faculty, with assistance from the Assessment and Evaluation Division of the OEA.

Pennsylvania State University College of Medicine

ROBERT C. ABER, MD

Curriculum Management and Governance Structure

- The dean of the college of medicine is ultimately responsible for assuring that the curriculum effectively supports the college's educational goals and objectives, and meets the standards for accreditation established by the Liaison Committee on Medical Education.
- The dean is supported in this endeavor by the senior associate dean for medical education, who oversees the Office of Medical Education, which provides centralized administrative support to the Committee on Undergraduate Medical Education (CUMED) Policy and Oversight group; the CUMED subcommittees on years one and two, and years three and four; the Interdisciplinary Course Committees (years one and two); and clerkship directors (years three and four).
- The senior associate dean is supported by assistant deans for medical education, academic information, and continuing medical education.
- The key unit for each interdisciplinary course in years one and two is the Interdisciplinary Course Committee, which determines prerequisite knowledge and skills, learning objectives, appropriate educational modalities, examinations, and remediation, if necessary, for the course.

Office of Education

- The College of Medicine has an Office of Medical Education that supports centralized administrative and logistic functions for all courses of instruction, including curriculum evaluation.
- The office was established in 1992, but has grown over the past eight years as more of the curriculum support has been shifted from departmental offices to the Office of Medical Education.
- The Office of Medical Education now provides support for all course scheduling; collation, printing, and distribution of all course materials, including computer-based learning (CBL) cases and examinations; course budgets; curricular evaluation; staffing of CUMED and its subcommittees; and other miscellaneous support.
- The Office of Medical Education currently has 3.5 FTE staff, 0.6 FTE faculty for CBL development and facilitator training, and 0.2 FTE faculty for curricular evaluation.

Budget to Support Educational Programs

- There is a distinct budget for medical education as the school is transitioning to mission-based budgeting in the college.
- The Office of Medical Education oversees distinct budgets for each course in the first and second years; the standardized-patient (SP) program; the OSCE at the end of year three; and curricular evaluation.
- Each department chair must specifically identify faculty effort for medical student instruction as part of an annual zero-based budgeting process.
- The Office of Medical Education provides departmental and faculty-specific information about instructional effort during the first and second years for each academic year.
- Faculty effort in the third and fourth years has proven more challenging to track and is currently estimated by department chairs.

Valuing Teaching

- The school has formal programs for faculty development using a variety of instructional formats. A half-day training seminar for CBL facilitators is offered six to eight times annually.
- The school has developed a videotaped presentation for CBL facilitators and has a special section in the library dedicated to medical education, including CBL and small-group learning.
- The assistant dean for continuing medical education has developed and implemented a year-long series focusing on various aspects of faculty development, including leadership and teaching.
- Penn State provides occasional focused workshops on education, teaching, examination development, use of standardized patients, development of case scenarios, and so on.
- The recent endowment of a chair in medical education will provide an opportunity for the senior associate dean

for medical education both to annually recognize outstanding faculty educators with a supplemental financial awards and to develop competitive education-initiation grants for faculty.

- Plans are under way to establish a Center for Medical Education that will provide a focal point for faculty most interested in medical education and promote recognition for them.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- There are specific recruitment, retention, and educational objectives for the medical student curriculum (a copy is available from the author).
- Additionally, each course and clerkship has specific learning objectives, as does each CBL case.
- The CUMED Subcommittee on Curriculum Evaluation will be reviewing the college's overall objectives with an eye toward developing more specific exit objectives for each student. This process has just begun.

Changes in Pedagogy

- A separate, voluntary PBL track was introduced in year two in the fall of 1992 and in year one in the fall of 1994. Approximately 25% of each incoming class elected to participate, and each year more faculty became familiar with and supportive of PBL.
- Changes have been implemented in each year of the curriculum as part of the Generalist Physician Initiative supported by The Robert Wood Johnson Foundation and the Commonwealth of Pennsylvania (1994–2000), including a primary care preceptorship (one week) and the Introduction to Medical Practice course in year one; the Issues in Medical Practice course in year two; a required primary care core clerkship in year three; and a required primary care selective in year four.
- A special primary care honors program in year four provides one-semester tuition support for three to five students selected through a competitive process.
- Following an LCME site visit in March 1995, a Task Force on Integrating the Curriculum in Years One and Two developed a set of principles for medical student education and recommended bringing the two curricular tracks together into a single, multidisciplinary, hybrid curriculum utilizing a variety of teaching and learning modalities, including CBL.
- The new curriculum was implemented in the fall of 1997 for all entering students.

Application of Computer Technology

- Students are not required to own computers, but most do.
- The Computer Learning Center adjacent to the library is open 24 hours a day, seven days a week, for students to use.
- Computers connected to a common server in all of the 16 CBL rooms are always available.
- The school has developed an intranet site that provides access to all course schedules, student and faculty e-mail addresses, lecture notes provided by faculty, research interests of faculty, course and faculty evaluations by students, results of examinations, and news items related to curricula or education.
- The CUMED Subcommittee on Medical Informatics has recently developed a plan approved by CUMED for integrating medical informatics throughout the four-year curriculum.
- In several cases computer-based instruction or examinations have been developed as part of the instructional program.

Changes in Assessment

- Various evaluation techniques are in place, including student focus groups, written evaluations by students, faculty focus groups, and annual CUMED and course director retreats to review and refine this new curriculum.
- The school introduced a standardized-patient program for both instructional and assessment support in July 1997, and an OSCE for all students at the end of year three in 1999.

Curriculum Review Process

- There is a formal process for ongoing review and evaluation of our medical student education program.
- In addition to student focus groups and written course evaluations, faculty evaluations, and annual faculty–student retreats, there is a formal CUMED Subcommittee on Curriculum Evaluation.

- During the next 18 to 24 months, the third and fourth years of the curriculum will be reviewed.
- The first- and second-year courses are continuously refined.
- Additionally, more specific exit objectives will be developed and there will be mechanisms to assure that appropriate instruction is provided for each objective within the curriculum.
- It is hoped that the standardized-patient program will grow and be used by more course and clerkship directors for both instruction and student assessment, including CME programs.
- Five major curricular renewal projects have been undertaken during the past decade, as follows: (1) introduction of a voluntary PBL track in the fall of 1992; (2) introduction of primary care courses and instruction; (3) introduction of a standardized-patient program in 1997; (4) integration of our two curricular tracks in years one and two into a single multidisciplinary, hybrid curriculum in the fall of 1997; and (5) a major college of medicine education retreat in May 1999 for faculty, students, and administrators that focused on the environment for graduate and medical student education within the college of medicine.
- Barriers to curricular renewal have included: (1) slow faculty buy-in and support for innovative instructional methods, such as PBL and CBL; (2) competing priorities for faculty time and effort among our four missions; (3) student wariness as to whether the new curriculum would successfully prepare them for required examinations, e.g., USMLE Steps 1 and 2, and subsequent courses or GME programs; and (4) financial constraints, as clinical income used to support college educational programs and faculty effort has been reduced over the past three to five years.

University of Pennsylvania School of Medicine

GAIL MORRISON, MD

Curriculum Management and Governance Structure (See Figure 1)

◆ Prior to 1997, there were associate deans for basic science and for clinical education under the vice dean for education. The associate dean for network and primary care education was not included under the direction of the Office of Academic Programs (APO), but reported to the dean. Each department appointed an academic coordinator who was responsible for their course(s) within the curriculum.

◆ The governance of the educational program was restructured by the vice dean for education and implemented in 1997 with the launch of the school's revised four-year curriculum, Curriculum 2000® (CU2000). The responsibility for the educational program resides in the APO under the vice dean for education.

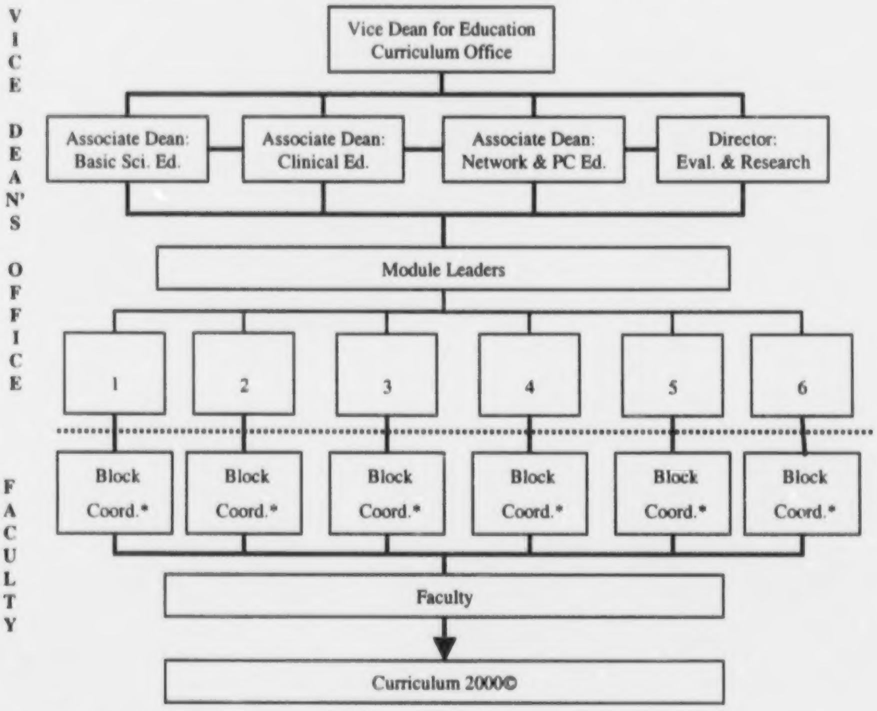
◆ The management of the entire curriculum is centralized under the vice dean for education.

Office of Education

◆ The APO became the centralized office to support the educational program and faculty teaching in the curriculum in 1997.

◆ There is no separate office of education outside the APO.

FIGURE 1: Governance Structure and Management


VICE DEANS' OFFICE
Vice Dean for Education Curriculum Office
Associate Dean: Basic Sci. Ed.
Associate Dean: Clinical Ed.
Associate Dean: Network & PC Ed.
Director: Eval. & Research
Module Leaders
1
2
3
4
5
6
FACULTY
Block Coord.*
Block Coord.*
Block Coord.*
Block Coord.*
Block Coord.*
Block Coord.*
Faculty
Curriculum 2000©

*Block Coordinators appointed by Department Chairs

Budget to Support Educational Programs

- Within the budget of the APO are funds for all offices of curricular support.
- For the implementation of CU2000, in August 1996 the dean allocated $3 million to the vice dean to be used over a three-year period for faculty and capital expenditures.

Valuing Teaching

- The vice dean for education is the only individual funded 100% for the APO.
- Associate deans are part-time individuals funded by the APO. The percentages of time funded vary, ranging from 20 to 50% of their salaries.
- Module leaders are funded at 20% of their salaries, capped at the NIH salary cap of $129,500 for grants.
- Block leaders from clinical departments who teach in basic science modules are compensated based on the lengths of the block.
- The APO designed and implemented a database in the fall of 1997 that tracks faculty lecture-based teaching. The database provides data for faculty teaching effort and is linked to an on-line system of evaluation of the curriculum.
- The APO is responsible for preparing teacher dossiers for those faculty being considered for reappointment and promotion.
- In order to be promoted, faculty in the tenure and clinician educator tracks need to show excellence in teaching.

CURRICULUM RENEWAL PROCESS

- The principles of the curricular renewal process are that
  - medical education should be a continuum
  - integration of basic sciences and clinical medicine should occur throughout the curriculum
  - the curriculum should maintain maximum flexibility
  - self-directed, lifelong learning should be emphasized throughout the curriculum

Learning Outcomes

- The faculty approved three major themes of the curriculum that provide the foundation for the domains on which the curriculum is based.
- The themes are Science of Medicine, Art and Technology of Medicine, and Professionalism and Humanism.
- The competencies agreed upon by the medical faculty may be obtained from the author.
- There are several domains that apply to various parts of the curriculum and are intended to provide a continuum of education across the entire four-year curriculum.

Changes in Pedagogy

- One of the tenets of CU2000 was to include more small-group learning experiences. To date, the curriculum is composed of lectures (34%), small groups (labs, case discussions) (58%), and self-directed learning (8%).
- All blocks of the curriculum, from Module 1 through Module 6, use clinical cases to illustrate key issues taught in those blocks.
- Standardized patients are used for both formative and summative assessments of history-taking and physical examination skills. Students begin working with standardized patients in their first year and continue throughout the curriculum.

Application of Computer Technology

- Students are not required to have their own computers.
- An information technology curriculum is integrated throughout the four-year curriculum.
- All lectures throughout Modules 1, 2, 3, and 4 (through the core clerkships) are videotaped, digitized, synchronized with slides, and uploaded to the virtual curriculum Web site.
- All students can access Virtual Curriculum 2000™ from any computer with Internet access. Virtual Curriculum 2000 was created in 1997 and now presents 1,700 lectures and 150,000 images and slides.

Changes in Assessment

- A standardized patient program was established in 1997 for formative evaluation of history-taking and communication skills, and physical exam techniques.
- All standardized patient interactions are videotaped for review by faculty and students.
- In order to matriculate to Module 4, students must com-

plete a satisfactory exam on a standardized patient as decided by the block director of the Introduction to Clinical Medicine course.

- Computers and Web-based programs are used in assessing students' skills in recognizing tissue samples and examples of pathogenic processes.
- Section leaders evaluate students in small-group sessions in the preclinical curriculum.
- In the clinical curriculum, students are evaluated and observed by any faculty member who spends two weeks or more with them.

Clinical Experiences

- In the required clerkships, students have tertiary and quaternary care experiences in hospitals; have community care experiences in hospitals; participate in both single and group practices in community settings; and participate in multidisciplinary primary practice groups and ambulatory care clinics.
- In elective and selective clerkships students may participate in preceptorships, rural-based clinical experiences, and international clinical experiences.

Curriculum Review Process

- CU2000 is reviewed and evaluated by a variety of mechanisms that include:
    - weekly meetings with student-appointed representatives, the associate dean for basic science education, module leaders, block leaders, instructors, and the associate director of the curriculum to evaluate the preclinical curriculum
    - monthly meetings with student-appointed representatives, the associate dean for clinical education, the associate dean for network and primary care, block leaders, the director of student affairs, and the associate director of curriculum to evaluate the required clerkships
    - quarterly meetings of the curriculum committee
    - a yearly review of the curriculum with the faculty (curriculum retreat), as well as an annual presentation to the medical faculty senate
    - presentations to the trustees of the medical school three times per year
    - students' evaluations of the entire curriculum via the Web

Future Goals and Challenges

These include

- maintaining funding sources for the continuation and development of the new program
- evaluating and assessing students' performances to see how well they are attaining the learning objectives
- evaluating faculty teaching efforts
- maintaining an on-line database evaluation system
- fostering faculty development to improve teaching skills
- making summative assessments of students' performances using standardized patients

University of Pittsburgh School of Medicine

STEVEN L. KANTER, MD, SHELDON ADLER, MD, CHARLES F. REYNOLDS III, MD, AND JOAN HARVEY, MD

Curriculum Management and Governance Structure

- The University of Pittsburgh School of Medicine (UPSOM) has a centrally governed curriculum that features active learning, a problem-based approach, an early introduction to the patient and the community, and the integration of a rigorous foundation in basic and clinical biomedical sciences with the social and behavioral aspects of medicine.
- The UPSOM curriculum is the outgrowth of five years (in the late 1980s and early 1990s) of self-study and planning, involving five major task forces and over 200 faculty and students.
- The Curriculum Committee (CC) was organized in 1991 as a standing committee of the faculty with student representation and was given responsibility and authority for all four years of medical student education. As the new committee began to prepare for its role as a centrally governing body, it became apparent that to govern effectively, an "effector arm" of the committee was needed to manage centrally the curriculum. The Office of Medical Education was founded as a component of the dean's office and was charged with implementation and management responsibilities.
- The curriculum was "phased in" one year at a time beginning in the fall of 1992.
- The central governance structure [described by Reynolds et al. in *Academic Medicine*, August 1995] facilitates the planning of curricular innovations and the implementation of new initiatives since the CC has the authority, including budgetary control, to complement its responsibilities.

Office of Education

- The Office of Medical Education (OMEd) was founded in May 1992 to implement the new hybrid problem-based learning curriculum for medical students.
- OMEd has grown with the curriculum and now includes academic counseling, course and clerkship evaluation services, testing services, information technology support, facilities management, advanced administrative support for special projects (e.g., community-based courses and clerkships), and instructional support.

Budget to Support Educational Programs

- The CC has a Resource Subcommittee that oversees the funding for all first- and second-year courses and selected third- and fourth-year activities.
- The Resource Subcommittee considers budget proposals and makes recommendations to the senior associate dean and dean about funding.
- The source of the education budget has been a combination of hard money funds from the dean's budget, new funds, and selected resources previously allocated to departments.
- Generally, the sponsoring department funds discipline-based third- and fourth-year clerkships and electives.

Valuing Teaching

- Faculty leaders for the educational program are recommended for appointment to the dean/senior associate dean by the CC's Executive Subcommittee.
- Faculty leaders frequently identify themselves by participating in an exemplary manner in an existing course or clerkship, by assuming administrative responsibility for a segment of a course or clerkship, by chairing an ad-hoc curriculum task force, or by designing an outstanding elective experience.
- Faculty leaders receive titles that describe their duties (e.g., course director, block coordinator).
- Faculty may be recognized by students (e.g., Golden Apple Awards, Excellence in Teaching Awards) or by the dean with advice from the CC (e.g., the Kenneth Schuitt, MD, PhD Award).
- Documentation of teaching excellence is required for promotion in non-tenure and tenure streams.
- Individuals whose accomplishments are exceptional at both individual and programmatic levels may be promoted primarily on the basis of teaching contributions.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- As part of the process to reorganize years three and four the Goals and Integration Task Force identified knowledge, skills, and values essential for attainment of the MD degree at this institution.

- The learning outcomes were reviewed and approved by the school's CC and by the Executive Committee, the dean, and ultimately the faculty.

Changes in Pedagogy

- Features of the new curriculum include: active learning; an emphasis on problem solving; an early introduction to the patient and the community; and the integration of a rigorous foundation in basic and clinical biomedical sciences with the social and behavioral aspects of medicine. Each senior student takes an innovative, integrated course in advanced biomedical science.
- Scheduled instructional time in the first two years of the new curriculum is apportioned approximately as one third lecture; one third small-group learning (much of which is problem-based learning; the remainder includes demonstrations, faculty-directed problem-solving exercises, skill-practice sessions, and other activities); and one third other (which includes observation of and limited participation in patient care, community site visits, experience with standardized patients, laboratory exercises, and other activities). This represents an increase in active learning and small-group learning compared with the traditional curriculum.
- The use of standardized patients for teaching and assessment is increasing. Simulated patients have been used for several years in the first-year Patient Interviewing Course to teach students how to obtain a history and how to communicate effectively with patients under a variety of circumstances.

Application of Computer Technology

- OMEd is responsible for facilitating and supporting the application and integration of information technology in the educational program. OMEd has a full-time information technology position. Duties of the individual who fill this position are application programming, instructional design consultation, equipment maintenance, and system administration, among others.
- The information technologist is supported by a 0.3 full-time equivalent position by contract with university computing services and by a campus-wide "expert partners" program.
- Each of 32 small-group rooms used for first- and second-year medical students is equipped with an Internet port and an X-terminal with servers maintained by the Office of Medical Education.
- Students have access to a host of resources such as images that have been specially digitized for viewing in support of scheduled courses (e.g., pathology specimens, EKG tracings, radiographs) and to resources available through Falk Library of the Health Sciences and World Wide Web resources.
- OMEd maintains Pitt-Med Curriculum Online, a Web-based application with domain-specific courseware to support student achievement of course objectives.
- Most courses in the first two years have digitized images, schedules, practice quizzes, and/or other material associated with specific instructional units. Some material is designed for reference and review, while other material is developed for in-class use (e.g., radiology images and procedure reports for use during a problem-based learning session).
- Web-based resources provide a history and review of a local community that first-year students visit as part of our Introduction to Being a Physician course.
- A third-year clerkship has a Web-based "patient and procedure log," material to support evidence-based information on selected topics, and other relevant readings, assignments, and schedules.
- Relevant links provide a faculty perspective on other valuable information resources for learners.
- A component of our on-line curriculum is the computer-based patient-care simulation that supports the Integrated Case Studies course. This course, the last taken by students in their second year, has as its objective the application of information learned during the first two years to case-based problems, further developing independent active learning and data-acquisition skills. The course functions as a bridge to the supervised patient responsibilities of the final two years of medical school. The format is exclusively problem-based learning, and all case materials and related case exhibits (e.g., radiographs, laboratory test results, procedure results) are available to students solely on-line [described by Schor et al. in *Academic Medicine*, September 1995].
- OMEd also maintains tools to support the administration of the educational program
- The development of the new UPSOM curriculum led to a productive collaboration with the health sciences library. The director and personnel of Falk Library for the Health Sciences are significantly involved in support and instruction for information seeking, retrieval, and management.

In a program initiated in the fall of 1992, incoming first-year medical students attend an orientation to library resources, including instruction in searching Medline and other databases. Subsequently, students have a more in-depth exposure to library and information resources in the problem-based learning segment of the Introduction to Being a Physician course (librarians participate in course development).

- A student-organized and student-run Computers in Medicine committee serves to promote the use of computer-based resources within the medical school community. In the early 1990s, the group initiated the automatic creation of computer accounts for incoming medical students, a system of e-mail lists, and an on-line medical student directory synchronized with the medical school registrar's database. Several years ago, the group developed a World Wide Web page designed to help incoming medical students find housing in the Pittsburgh area, which has evolved into a comprehensive set of Web-based resources for applicants and new students.

Changes in Assessment

- Performance-based assessment (using real patients) is used during the third-year internal medicine clerkship, in which each student is observed performing a complete history and physical exam by a senior faculty member. An OSCE that includes standardized patients for some stations and comprises a significant portion of the final grade is used to assess students' history, physical exam, and diagnostic skills at the end of the required 12-week community/ambulatory medicine clerkship. A comprehensive, CC-monitored, performance-based assessment is being implemented at the beginning of the fourth year.
- Computer-based applications have been used intermittently for assessment (e.g., in a portion of a dermatology final exam, neuroscience quizzes, digitized "movie clips" of clinical procedures).

Clinical Experiences

- Students begin their clinical experience by observing a faculty physician interview a patient on the first day of medical school.
- After observing several experts interview patients during the first few weeks of the curriculum, the students practice interviewing simulated patients during the Patient Interviewing course.
- In the second half of the first year each student sees patients (approximately one half-day every other week) with a primary care practitioner in the Western Pennsylvania region as part of our Ambulatory Care course. This course continues through the first half of the second year, in which each student participates in a service learning experience associated with our Program for Healthcare to the Underserved.
- Various voluntary activities provide supplementary clinical experiences during the first two years, including: Bridging the Gaps (a seven-week summer internship in a community clinic); Area Health Education Center (AHEC)-supported initiatives; work in shelters for the homeless and for victims of domestic violence; and others.
- Most students participate in one or more voluntary clinical experiences.
- The third and fourth years are primarily grounded in appropriately supervised clinical experiences.

Curriculum Review Process

- The CC is charged with ongoing review of the medical student curriculum, which is conducted through evaluation of individual courses and clerkships, analysis of external and internal data, examination of special issues with ad-hoc task forces, and appraisal of the curriculum as a whole at an annual colloquium attended by over 100 invited faculty and students.

Future Goals

- During the next five years, key issues to be addressed by the CC will include:
    - options for training clinician–scientists, including a research experiment for all medical students
    - the effectiveness of the problem-based learning initiative
    - the quality of current community/ambulatory education methods and sites
    - the integration of education in palliative and end-of-life care issues, medical informatics, and evidence-based medicine, and complementary and alternative medicine

Temple University School of Medicine

GERALD H. STERLING, PHD, SALLY E. ROSEN, MD, AND RICHARD J. KOZERA, MD

Curriculum Management and Governance Structure (See Figure 1)

◆ The Curriculum Committee is a standing committee of the School of Medicine whose membership includes nine faculty, two students, and the associate or assistant dean responsible for the curriculum. Duties of the Curriculum Committee include:
- ongoing review and evaluation of the design, completeness, continuity, and effectiveness of the curriculum and to assign the responsibility for curricular areas to departments;
- reporting its findings and recommending changes to the dean, executive faculty, and faculty senate;
- interpreting the curriculum for faculty and students; and
- informing the students, faculty, executive faculty, and dean about the curriculum to be implemented each year.

The dean is responsible for formally responding to the recommendations made by the Curriculum Committee.

◆ The medical school bylaws were modified to ensure centralized management of the curriculum in order to better effect change and to assure integrated institutional responsibility for a coherent and coordinated curriculum.

Office of Education

◆ There is an Office of Medical Education.

◆ The responsibilities of the office were enhanced to include: greater role in management of the curriculum; initiation of a curricular review and renewal process; implementation of curricular renewal; coordination of faculty development in education; coordination of a planned Instructional Support Center (described below).

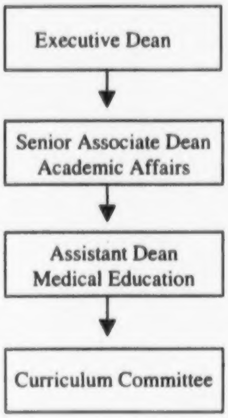
Budget to Support Educational Programs

◆ Derived primarily from University-allocated funds, contributions to the clinical and educational missions of the school have remained stable.

Valuing Teaching

◆ Faculty are recognized through departmental and school support (e.g., administrative designations, computer and technology equipment, travel to appropriate education meetings), school and university awards for excellence in teaching, and adjustment in compensation.

FIGURE 1: Curriculum Management and Governance Structure



CURRICULUM RENEWAL PROCESS

Learning Outcomes

◆ The process used to determine outcomes for the educational program included:
- A new curriculum committee renewal process was initiated.
- A Medical School Objectives Subcommittee was charged with defining learning outcomes.
- Subcommittee recommendations based upon the AAMC's MSOP, the school's mission, and a strategic planning process.
- Recommendations reviewed by faculty at a curriculum retreat.
- Recommendations approved by the Curriculum Committee, executive faculty, and the dean.
- A learning outcomes document modified as part of the curricular renewal process was used as a working document.

- A list of outcomes is available from the authors upon request.

Changes in Pedagogy

- Basic science courses use clinical cases to enhance the learning of key concepts.
- Cases are presented through clinical correlation (by clinical faculty), small-group workshops, and computer-assisted learning.
- Standardized patients are used for teaching/assessment of basic communication skills, including interviewing/history taking, in Fundamentals of Clinical Care courses.
- Standardized patients are used to teach and critique interviewing skills in a psychiatric setting in the psychiatry clerkship.

Application of Computer Technology

- Students are not currently required to have computers. The issue will be revisited periodically.
- A computer and information technology subcommittee of the Curriculum Committee has recommended an approach to further incorporate the principles and methods of medical informatics into the curriculum.
- Computer technology is incorporated into several basic science courses, including anatomy, physiology, pathology and biochemistry for laboratory material, case studies, handouts and self-study; and into the family practice clerkship in a case-of-the-month format.
- An Instructional Support Center (ISC) is planned to create a formal administrative structure that will provide leadership and technical support personnel essential for the implementation and assessment of all academic computing and information technology efforts in the School of Medicine.
- The ISC initiative includes plans for ongoing formal opportunities for faculty development of medical informatics skills.
- Classroom space has been upgraded to electronically "smart" classrooms, including appropriate technology hardware to support educational initiatives.
- Planned renovations of the primary teaching building will provide an infrastructure to allow maximally flexible space to support a variety of teaching methods.

Changes in Assessment

- Curricular initiatives, based upon the curricular review and renewal process, may include:
  - expanded use of standardized patients
  - use of computers for examinations
  - expanded use of faculty observations in FCC and clinical rotations
  - addition of OSCEs at the end of year two and the beginning of year four

Clinical Experiences

- Clinical experiences include preceptorships in hospital physicians' offices (years one and two) and inpatient and ambulatory experiences (years three and four).

Curriculum Review Process

- The process of curricular review/renewal:
  - The dean charges the Curriculum Committee with establishing goals and objectives (Nov. 1997)
  - Subcommittees established for: medical school objectives; first biennium; second biennium; computer and information technology; clinical skills assessment (Dec. 1997)
  - Subcommittees present preliminary recommendations at faculty curriculum retreat (Dec. 1998)
  - Faculty forums held throughout process
  - Curriculum Committee finalizes recommendations (Apr.–Sept. 1999)
  - Recommendations sent to the dean (Sept. 1999)
  - The dean reviews recommendations and reports to faculty and executive faculty (Mar. 2000)
  - Implementation plan being developed, to take place over three academic years (beginning Sept. 2000)
- The goals of the curricular renewal are to:
  - develop centralized governance of curriculum
  - develop a consensus on the knowledge, skills, behaviors, and values that all students should possess
  - develop learning objectives and education strategies for acquiring those attitudes and skills
  - establish methods to assess student performances and evaluate program effectiveness
  - provide appropriate faculty development and recognition for education initiatives/contributions
- The themes of curricular renewal are to:
  - integrate basic science and clinical medicine throughout the curriculum
  - integrate subject material within each semester
  - balance didactic and small-group student-centered learning experiences in order to provide lifelong learning and critical thinking skills
  - incorporate the use of new teaching methods and,

    where appropriate, expand the use of computers as an educational tool
  - incorporate the principles of medical informatics into the curriculum
  - balance inpatient and ambulatory experiences and provide a longitudinal ambulatory experience
  - emphasize professional attitudes and behaviors
  - incorporate essential longitudinal topics into the curriculum
  - expand the use of standardized patients in teaching/assessment of clinical skills
- Resources needed for planning/implementation include
  - support dean's office
  - faculty time allocation
  - resources/personnel for the ISC
  - support from chairpersons
  - faculty development
- Challenges are
  - finding faculty time, especially from clinical faculty
  - finding the resources needed for faculty development
- Process for ongoing review:
  - Course/clerkship directors to submit annual reports and updates of information for their portions of the curriculum database to the Office of Medical Education and the Curriculum Committee for review
  - Course/clerkship directors hold regular meetings.
  - All current courses, including electives, undergo biannual review.

Future Goals

- To revisit the requirement for students to have laptop computers
- To define goals/objectives of electives
- Student-centered learning in the first biennium
- Expanded use of standardized patients

[illegible]niversidad Central del Caribe School of Medicine

HELE[illegible] [illegible]OSA, MD, JOSÉ GINEL RODRÍGUEZ, MD, AND ARÍSTIDES CRUZ, PHD

Curriculum Management and Governance Structure

- ◆ The planning, management, and control of the curriculum are an integrated responsibility shared by the faculty and the academic administrators at the school.
- ◆ Since 1995, the Curriculum Committee has been responsible for the design and management of the curriculum.
- ◆ Prior to 1995, the primary responsibility for the curriculum was departmentally based.
- ◆ The dean appoints faculty members to the Curriculum Committee (see Figure 1).
- ◆ The three ex officio members of the curriculum committee include the coordinator of the Curriculum and Faculty Development Office, the director of educational Research, and the director of the Center for Academic Resources.
- ◆ The three subcommittees meet regularly to ensure integration between courses, and to oversee implementation and evaluation of the curriculum.
- ◆ The Curriculum Committee evaluates all curricular matters, including the approval of new courses, the approval of changes in existing courses, deletion of courses, and changes in curricular models.

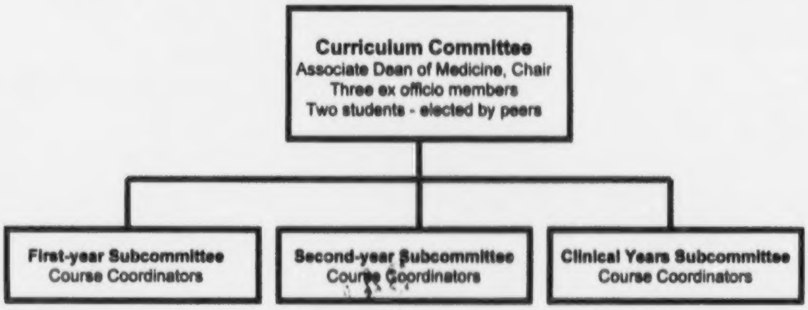
Office of Education

- ◆ The Curriculum and Faculty Development Office and the Educational Research Office of the university support the educational program of the School of Medicine.
- ◆ The dean, the associate dean of medicine, and the faculty may receive support from these offices or through the dean for academic affairs.

CURRICULUM RENEWAL PROCESS

- ◆ The themes and goals of the curricular renewal process include:
  - All curriculum units (course or clerkship) should have clear objectives specifying expected student performance.
  - Integration of basic and clinical science should be emphasized in all courses and clerkships.
  - All curricular units should be designed to encourage long-term retention and application of learned material.
  - Structured clinical experiences would begin in the first year of the curriculum and continue throughout all years.
  - Time would be available for students to pursue self-directed learning activities.
  - Curriculum units would promote interactive learning in groups.
  - There would be an emphasis on ambulatory care.
  - Institutional resources would be provided to support the development and implementation of the curriculum.
- ◆ The goal of the school is to have graduates with a solid

FIGURE 1: Curriculum Management and Governance Structure



knowledge base and who practice medicine with an ethical, humanistic outlook.

- In 1995, the dean appointed the new Curriculum Committee and redefined its composition and functions. Since that time, the following activities have occurred:
    - Principles to guide the curriculum revision process have been defined.
    - Different educational models have been evaluated.
    - Expectations of a physician for 2000 have been identified and documented.
    - A consultant was recruited to guide the committee in curriculum mapping.
    - A conceptual framework for the new curriculum was adopted.
    - The strategies to be used in teaching and assessment have been determined, requiring interaction between and among both basic science and clinical departments.
    - New materials and equipment have been acquired and/or developed.
    - The new curriculum content and assessment strategies have been piloted.
    - There are continual follow up and support of faculty in the new curriculum.
    - Evaluation (monitoring) of the pilot implementation is occurring.
    - Final required modifications are being determined and implemented.
- The curriculum planning process was divided into preclinical (first two years) and clinical (last two years) phases.
- The curriculum committee has named two ad hoc committees to work in the areas of behavioral science and genetics to incorporate these topics in the curriculum.

Curriculum Review Process

- The entire curriculum will be reviewed during Academic Year 2000–2001.

Learning Outcomes

- As part of this renewal, competencies for UCC-SOM graduates were determined.
- The school used the following resources to develop the competencies:
    - The school's mission
    - Graduate profile, as defined by the faculty
    - Changing health care in Puerto Rico
    - Societal needs
    - The GPEP and ACME—TRI reports
    - The MSOP objectives
- The Curriculum Committee was charged to develop the competencies using all the information collected.
- The list of competencies is available from the author.

Changes in Pedagogy

- Prior to 1995, the educational program relied heavily on the lecture format and a teacher-centered approach to learning.
- With the curriculum revisions, the educational program is shifting to a student-centered, active-learning approach.
- Small-group experiences have been integrated at all levels of the curriculum, including:
    - Basic science courses use clinical cases to stimulate application of the concepts learned.
    - The Longitudinal Bioethics and Humanities curriculum relies heavily on small-group discussion and student presentations under faculty guidance.
    - Internal medicine uses structured case presentations, with three students presenting cases and discussing cases with one faculty member.
    - Problem-based learning courses in the first and second years are focused on stimulating the integration and application of basic sciences to clinical situations. Students also develop self-directed learning and medical informatics skills in these PBL courses.
- The Center for the Development of Clinical Skills uses standardized patients for teaching and assessment.
- Students interact with standardized patients beginning in their first year.

Application of Computer Technology

- Students are not required to own computers.
- There has been a dramatic increase in the use of computer technology in the educational program since 1995.
- The school is presently using appropriate software to enable course coordinators to put course information on line and to link to other related sites on the Internet.
- The goal is to organize all educational experiences using the software.
- Course coordinators and faculty communicate with students on line using e-mail, chat rooms, discussion boards, and electronic file drop boxes.

- The school is using specialized testing software and is creating an Electronic Testing Center.
- The program that is used, LXR Test, has facilitated the creation of a departmental and institutional test-item bank to assist faculty in designing formative and summative student assessments.
- Instructional software is used in the classroom and in the two student computer labs.
- Interactive programs are available for the clinical clerkships.

Changes in Assessment

- Standardized patients, faculty observation, and OSCEs have all been added to the assessment methods used in the four-year Longitudinal Clinical Skills curriculum and in the clinical clerkships.
- Uniform evaluations have been developed to assess daily work, case presentations, and clinical reasoning in clerkships.
- There are departmental examinations, and departments use the NBME subject exams.
- Students maintain logs to monitor their experiences in the Longitudinal Primary Care preceptorship; the logs are used for assessment of the students' progress.
- Many courses and clerkships require students to make presentations that are evaluated and graded.
- Many of the courses that have small-group discussions have developed evaluation forms to assess student participation in an objective manner.
- The school has increased the amount of formative assessment students receive.

Clinical Experiences

- Students are required to participate in the Longitudinal Primary Care preceptorship during their first and second years.
- Every student spends a half-day a week, every other week, in a physician's office.
- During their clinical years, students have clinical experiences on hospital wards, in clinics, and in ambulatory settings.
- As a component of the Longitudinal Primary Care preceptorship, students have the opportunity to deliver lectures on health topics in schools, clubs, and other community settings.

Planning Resources Needed

- Consultants were used in both the process of curricular renewal and the implementation of the changes.
- The university identified funds for the acquisition of computers, software, and other educational materials.
- Faculty members with particular interests and/or ability in teaching were identified and their salaries were paid for with institutional dollars.
- Faculty recognize the importance of maintaining a correlation between the educational objectives and the assessment methods used. Since 1995, a specialist in test measurements has served as a consultant to assist in the construction and analysis of tests.

Ponce School of Medicine

MANUEL MARTINEZ-MALDONADO

Curriculum Management and Governance Structure

- Before 1994, the Curriculum Committee was made up primarily of department chairs. It consisted of 12 members, all chairs of basic and clinical science departments. Student representation was minimal. Although its main responsibility was curriculum evaluation and improvement, it did not have authority to implement the changes necessary for any significant improvement in outcome measures. In the fall of 1994, the committee was completely reorganized with the main purpose of centralizing accountability for the design and management of a curriculum that would reflect the educational objectives of the medical school.
- The governance structure and management of the educational program are centralized in a committee with the authority to develop, implement, and evaluate a coherent and coordinated educational program. Centralization of curriculum management has been in place since the fall of 1994.
- There is one academic-year committee for each year of medical studies. It is composed of all course directors/coordinators and one elected student representative. The dean for academic affairs appoints its chair, the academic-year director. The committee is responsible for planning the academic year according to the results of curricular evaluation. Each member is aware of what, how, and when, the others are teaching, thus facilitating better coordination and integration of courses.
- The Curriculum Policy Committee (academic-year directors, four student representatives, four faculty members, and the assistant dean for education, who is an expert in education and curriculum) is responsible for development of the curriculum consonant with PSM educational objectives, and for curricular evaluation.
- Curricular development responds to needs identified in USMLE and NBME subject examination item-analysis reviews, content inventory (utilizing USMLE content outlines), and outcomes assessment data, as well as emerging public health issues or changing trends in health care delivery systems.
- Curricular evaluation has become a process of continuing quality improvement. The parameters analyzed by the Office of Academic Affairs include: student evaluations of the quality of teaching, definition and attainment of objectives, and methods used in teaching and evaluation; evaluations of teaching faculty by course/clerkship directors; grade distributions of departmental exams; USMLE and shelf exam scores, and NBME item analysis. The policy committee discusses the data and submits recommendations. These are presented to the course/clerkship director for implementation. Monitoring of the changes is based on feedback (as soon as appropriate and within the same academic year) from students who are taking the course and from outcomes evaluation data.

Office of Education

- During the academic year 1995–96 the Office of Medical Education was established, under the direction of a physician educator and responsible to the dean of academic affairs. The director's primary responsibility was to assess the effectiveness of the medical program in order to develop strategies for improving the academic offerings. As a result many changes were introduced.
- In 1997 an educator with doctoral studies in curriculum and instruction was appointed to further the development of the office. Other responsibilities were defined to include functions related to curriculum planning, faculty development, and evaluation. During 1998–99 this office was renamed as the Office of Education and the director promoted to assistant dean of education. She is responsible for all aspects of supporting faculty in the design and implementation and evaluation of the educational program.

Budget to Support Educational Programs

- An identified budget to support the educational program has been in place since the founding of the Ponce School of Medicine and approved by a board of trustees in 1978. The education budget is allocated to support administration, research, instructional activities, health services, student services, and graduate studies.
- The sources of the funds include student tuition and fees, federal and local grants, investments, reference lab revenues, fundraising and development, tuition from summer courses, and scholarships, among others.

Valuing Teaching

- Every faculty member must be evaluated by his or her department at least every two years. Each department may develop weight scores for each evaluation category for individual faculty. The numbers of criteria to be satisfied increase in parallel with increases in academic rank.
- Nominations for faculty promotion originate from the department chairs. A recommendation must include supporting documents demonstrating that the candidate has fulfilled the required criteria for promotion.
- Ponce School of Medicine has developed general criteria to guide the processes of evaluation and promotion (Faculty Manual 1993). These criteria include
  - teaching quality
  - value to the department
  - evaluations from students, peers, department chair
  - research and/or scholarly development
  - other professional activities

CURRICULUM RENEWAL PROCESS

- Goals of the curricular renewal effort are
  - to develop a coherent, integrated, effective curriculum that promotes student-centered teaching and learning
  - to improve student achievement
  - to qualify students for graduate medical education
- Themes for curriculum renewal are
  - increased vertical and horizontal integration of basic and clinical science courses
  - emphasis on lifelong independent learning and on critical-thinking and problem-solving skills
  - development of performance-based assessment methods for the evaluation of clinical skills
  - integration of information technology into the educational process
  - student performance on USMLE Step 1
  - emphasis on preventive medicine and health promotion
  - expansion of ambulatory care experiences
  - academic credentials of the applicant pool
  - use of small-group discussion

Learning Outcomes

- During the restructuring process in 1994, an explicit statement addressing the learning outcomes students must demonstrate after completing the medical program was developed by the faculty and presented and approved by the academic senate.
- The outcomes were used to specify the instructional objectives of courses and clerkships that enable students to achieve them. [The list of outcomes is available from the author.]

Changes in Pedagogy

- There is more emphasis on self-directed learning and development of critical-thinking and problem-solving skills.
- Computer-assisted instruction has been introduced.
- Some case-based clinical correlations in the preclinical years use the PBL format.
- A midclerkship feedback session has been incorporated in the clerkships.
- Faculty use teaching techniques that promote student-centered learning.
- Lecture time has decreased, with an increase in small-group discussions.
- Standardized patients are used for teaching and assessment of core clinical skills.
- Time for students' self-directed and independent learning activities has been increased.
- There is increased emphasis on faculty observation of students' clinical skills.
- PBL and evidence-based medicine concepts are included in the clinical years.
- There is a focus on preparing students to be generalist physicians, with emphasis on preventive medicine and health promotion.
- Ambulatory care experiences have increased.
- Interdisciplinary, integrative small-group discussion sessions are included.
- Basic science courses are taught using the organ-system approach.
- Student departmental exams use the USMLE format.

Application of Computer Technology

- PSM appointed a computer science expert as LAN administrator, staffed with two assistants to manage the educational computing resources at the school. The school received a NIH grant of $250,000 with matching funds from the institution for providing access to the Internet. At present, PSM has available a dedicated 56K line that connects our Internet servers to the central facilities of the UPRNET. This is the central station where all campuses of the University of Puerto Rico have access to the Internet.

- PSM has been wired with 100Base T cable and fiberoptics capable of videoconferencing.
- Concomitantly, with the development of the LAN and Internet connection, the audiovisual office continues to be upgraded and is now capable of providing all services that are expected, such as digital image manipulation and slide processing.
- Approximately 30% of the faculty have received support to attend off-site workshops on computer technology.
- The school is offering individual faculty assistance and on-site faculty development programs for both beginners and experts, with the participation of library staff and faculty experienced in integrating computers into the educational program.
- 40 working units, all connected to the Internet, are available to students in the library facilities.
- The library purchased audiovisual and software materials in basic and clinical sciences topics based upon recommendations made by the faculty. Software is available in the library and in the main clinical teaching sites.
- First-year students receive an orientation to desktop computing and Internet communications in a skills-oriented workshop offered during the first week at PSM.
- As they participate in "Getting started in PBL," a self-directed learning program, students search Medline and learn to use the Internet.
- In 20% of the preclinical courses, computer-based education is required: some departments request assignments based on computer programs, and specifically, physiology assigns the students small-group-discussion case questions that require them to search the Internet. For the rest, computer-based education so far is optional.
- In 70% of all clinical clerkships, computer-based education is required. PBL sessions in pediatrics, case-based problem solving exercises in internal medicine, case work-ups and presentations in surgery, and patient logs and clerkship evaluation forms in family medicine all require student interaction with computers.
- At present, computers are utilized for teaching as a complement to other formal teaching methods. We are in the process of developing methods for testing and assessment through the use of computers.

Changes in Assessment

- The medical school faculty uses many evaluation methods to assess student performance.
- Methods commonly used to assess students' clinical skills in the third and fourth years include
    - written examinations using the MSQ format
    - NBME subject examinations
    - case presentations
    - clinical performance evaluations
    - direct observation by a faculty member of a student taking a complete history and conducting a complete physical examination
    - case simulation using SPs for interviewing and physical examination
    - clinical practice examinations using SPs and interpretation of lab and test data
- Written examinations using MCQ format are utilized in all clerkships.
- NBME subject examinations are the final examinations of the clerkships. They are utilized for comparison of Ponce School of Medicine student achievement with national norms of accomplishment.
- Case presentations have been one of the principal methods of formative and summative evaluation of medical students. Students are assigned patients and are required to present all cases to supervising teaching faculty. Faculty and students are oriented as to performance criteria to assure consistency of the results. The faculty member evaluates the student's case-presentation skills, offers feedback to the student, and includes a summative evaluation of this skill in the clinical performance evaluation.
- The pediatrics clerkship assesses students using an evidence-based case presentation that includes computer printouts of the literature-searching strategy and uniform formats to report the critical appraisal of medical literature.
- Clinical performance evaluation uses a global rating scale in a standardized form (Student Evaluation Form of Clerkship Clinical Performance) developed and validated by the faculty with technical assistance of the Office of Education.
- The standard form has been used by all clinical clerkships for the past four years. Formative, mid-clerkship feedback is provided to students using the same dimensions of the evaluation form.
- Direct observation by faculty members of students taking a complete history and conducting a complete physical examination has been well documented in the family medicine clerkship since its inception in 1993. A closed-circuit audiovisual system allows for faculty observation of students using their clinical skills. Student encounters with real patients were recorded and reviewed with students for direct feedback.
- In 1995–96, checklists with specific observable behaviors were developed and used by all clinical faculty to

evaluate student performances during history taking and physical examination.

- Clinical faculty from each clerkship are selected to attend specific workshops on teaching and evaluation of clinical skills, and are chosen as proctors for direct observation of clinical skills.
- Students receive formal, performance-based learning and evaluation of basic clinical skills in their second-year Introduction to Clinical Medicine course. Every student is observed interviewing and examining at least four patients by the end of the second year.
- Students, through their patient logs, document and provide indirect evidence that direct observation has occurred. It is a requirement to demonstrate competence in these skills in order to pass the clerkship.
- The obstetrics–gynecology clerkship requires two summative evaluations of clinical skills, one obstetric and the other gynecologic.
- Case simulations using SPs assess interviewing and physical examination skills.
- As of 1995–96 in family medicine, and since 1996–97 in the rest of the clerkships, standardized patients have been used for formative evaluations of clinical skills.
- Standardized patients are used in small-group sessions, where a student evaluates a standardized patient portraying a challenging primary care problem while the other students watch through the audiovisual system. The group discusses the student's performance, feedback is given to the student, and then a second student interviews the patient again.
- A standardized family has been incorporated where each student evaluates a standardized patient portraying a member of the family. Specific tasks and objectives are given for each patient. The students then meet with a faculty facilitator who guides them in a discussion of the various issues concerning the patient encounter. At the end of the family medicine clerkship each student will have participated in about eight encounters with standardized patients, allowing for formative evaluation of the student's clinical performance.
- A multiple-station clinical-skill assessment is given to students in the fourth week of the third-year clerkship. The objective of the exam is to evaluate the overall clinical skills of students in the evaluation and management of problems in family medicine.
- Standardized patients have been used as a tool to evaluate medical students as part of the summative evaluation of students in the third year family medicine clerkship starting with the academic year 1998–99. A clinical skills assessment examination is given in the fourth week of the clerkship and it will count as part (20%) of the clinical performance component of the student's final grade in family medicine.
- A clinical practice examination using SPs was developed as the evaluation instrument for the clinical skills with the purpose of assessing the readiness of fourth-year students for postgraduate training.
- A recent review of student evaluations has guided the Curriculum Policy Committee to make informed decisions about minimum acceptable levels of clinical mastery that promise to greatly enhance the consistency of performance assessments and improve student achievement. Some of these decisions are:
  - the establishment of 60 as the minimum passing score for the NBME subject exams
  - computation of the final grade based on a weight of 70% for clinical performance and a weight of 30% for the NBME exam scores
- All medical students must take and pass the USMLE Step 1 before formal promotion to the third year of medical studies and the USMLE Step 2 for graduation.
- Table 1 presents the methods of assessment used by the clinical clerkships during 1994 to 1999.

TABLE 1. Methods of Assessment of Students' Clinical Skills

	1994–95	1995–96	1996–97	1997–98	1998–99
Written exam MCQs	√	√	√	√	√
NBME subject exams	√	√	√	√	√
Oral examination case presentations	√	√	√	√	√
Clinical performance evaluation global rating scale	√	√	√	√	√
Direct observation by faculty of history and physical exam	*	*	√	√	√
Case simulation using SP for interviewing and physical examination	—	†	√	√	√
Clinical practice examination using SPs	—	—	—	√	√

√Employed in all clinical clerkships.

*Utilized in family medicine and medicine clerkships since 1994–95 and documented across all sites since 1996–97.

†Initiated in family medicine in 1995–96, this has been part of method of assessment of clinical skills in all clinical clerkships since 1996–97.

Clinical Experiences

- Clinical experiences for medical students start in the second year with inpatient and ambulatory teaching activities during the Introduction to Clinical Medicine course. During these experiences, they learn basic clinical skills.
- Third-year clinical experiences consist of six required rotations: medicine, pediatrics, and surgery (each of ten weeks' duration) and family medicine, psychiatry, and ob–gyn (each of five weeks' duration).
- Clinical teaching sites include private and public hospitals, clinics, and wards, physicians' offices, public ambulatory care facilities, and VA outpatient clinics.
- Time dedicated to ambulatory educational experiences is distributed as follows: family medicine, 100%; psychiatry, 70%; pediatrics 50%; ob–gyn, 50%; medicine, 30%; and surgery, 20%.

Curriculum Review Process

- Planning resources required for the curricular change included
    - physical space
    - funds to hire education consultants
    - faculty time
    - funds and personnel to conduct faculty development programs
    - funds to recruit faculty and directors
    - an increase in the educational budget
- Challenges of the curricular renewal process include:
    - faculty resistance to the need for change
    - fear of loss of autonomy in a more centralized curriculum structure among faculty and chair-persons
- The Curriculum Committee was vested with full authority to implement curricular changes.
- The Office of Education was established to provide assistance in curriculum development, implementation, and evaluation.
- The changes are monitored in order to modify the process.
- Feedback is provided continuously for curricular improvement.

University of Puerto Rico School of Medicine

ANTONIO MENDEZ-IGLESIAS, PHD, AND PHILIP SPECHT, PHD

Curriculum Management and Governance Structure

- Curriculum governance involves the dean, faculty committees, and the associate deans for academic affairs and clinical affairs.
- The Curriculum Office and the Evaluation and Medical Research Office provide administrative and professional support to the Dean and faculty committees.
- Committees with representatives from the faculty, the academic administrations, and students are responsible for the implementation of the curriculum. These include:
  - the Curriculum Committee (CC)
  - the Curriculum Revision subcommittee
  - a committee for each year of the medical school education program

Office of Education

- Several offices provide educational support: the Curriculum Office, the Evaluation and Medical Research Office, the Center for Informatics and Technology, the Hispanic Center of Excellence, and the Faculty Development Program. Although there is good communication between these offices, discussion is under way to consolidate their efforts into one comprehensive office.

CURRICULUM RENEWAL PROCESS

The following principles are guiding curricular renewal:

- Renewal should be a continuous and dynamic process.
- There should be an emphasis on self-directed and lifelong learning throughout the curriculum.
- Curricular renewal will include the integration of basic and clinical sciences at all levels of the curriculum.
- The curriculum will provide early clinical experience for students, with an emphasis on primary care.
- The topics of health promotion, preventive medicine, evidence-based medicine, medical ethics and economics, and the physician–patient relationship must be integrated throughout the curriculum.
- The educational program must develop a sound information technology infrastructure.
- The curriculum must provide information technology support to students and faculty.
- The curriculum will include a variety of teaching and assessment methods.

Changes in Pedagogy

- The previous dependence on classroom lectures has changed. Structural learning activities occur in the mornings, i.e., two hours for lectures or large-group activities and two hours for small-group active learning.
- Two hours per week (in the afternoon) are dedicated to PBL and another two hours per week are dedicated to clinical skills development and field clinical experience.
- The remaining afternoons are dedicated to self-directed learning.
- The curriculum for the first two years is organized into blocks of related content. Small-group activities such as modified PBL, POPS, clinical correlations, and labs are widely used for active learning.

Application of Computer Technology

- Since 1998 students have been required to have laptop computers.
- The mission of the medical school computer center has changed from training of the faculty to serving the medical students and supporting faculty curricular efforts.
- The computer center has been remodeled, all-new hardware has been installed, a dedicated Internet server has been installed, and new support staff have been recruited.
- Most required courses are Web CT based.
- Faculty training and support in educational technology are offered continuously.

Changes in Assessment

- Standardized patients are used for teaching and evaluation at all levels of the curriculum.

- Two CPXs are required, one at the end of the second year and one prior to graduation.
- NBME subject tests are required in most courses as part of the final grade.
- Computer-based practice tests are offered in most disciplines.
- The clinical faculty are using standardized observation tools for student assessment.

Clinical Experiences

- Beginning in late February 2000 first-year students have had the opportunity to conduct specific activities at physicians' offices in the nearby community.
- Because of health care reform, new alliances have been made with private hospitals and groups of health care providers that facilitate the opportunity for students to participate in clinical experiences at these sites.
- The emphasis of student clinical experiences is on outpatient health care.

Curriculum Review

- Funding and leadership from the dean is crucial.
- There is increased administrative support for the process.
- The school is establishing a Clinical Affairs Office to forge new alliances with community health care providers and managed care organizations.
- The school is establishing a state-of-the-art center for informatics.
- The school is developing a center for the teaching and evaluation of clinical skills (with standardized patients, anatomic models, and simulators).
- The school has begun to empower the CC by including representation of all interested sectors in its composition.
- A subcommittee of the CC has been created to review each course prior to implementation.
- Periodic curriculum retreats for faculty, administrators, and students are held to assess the strengths and weaknesses of the implemented curriculum.
- A standardized patient program is being developed to support the development and testing of clinical skills throughout the four years of medical school.

Resources Needed

- In order to accomplish the necessary curricular renewal, the following needs must be met:
  - A defined educational budget
  - Increased funding from the dean
  - Identification of a cadre of faculty for teaching at all levels
  - An increase in the number of faculty to teach/facilitate in small groups
  - Establishment of a formal faculty development program to facilitate curricular implementation
  - Increased administrative support
  - Additional rooms for small-group activities
  - Funding for curriculum retreats
  - Funding for education consultants

Strategies for Renewal

- The school has identified and begun to develop the following strategies to accomplish the curricular renewal:
  - Strong leadership by the dean
  - Establishment of a Clinical Affairs Office to diversify clinical teaching sites
  - Student involvement in all committees
  - Maintenance of departmental control over specific curricular content/disciplines
  - A curriculum retreat at the end of the academic year to assess the impact of the changes
  - Inclusion on the CC of faculty (majority), administrators, students, and some department heads

Challenges to Overcome

- Several significant challenges needed to be overcome. They were
  - faculty resistance to change
  - fear of loss of power by faculty and department heads
  - reduction of clinical faculty teaching time due to demands from the health reform of the Puerto Rico Department of Health and the shift to managed care
  - assigning of a substantial educational budget
  - reaching consensus regarding curricular content, sequencing, integration level, and educational methods to be used

Evaluation of Curriculum Renewal

Plans for evaluation and review of the curriculum include

- Regular CC meetings to assess implementation.
- Continuous oversight by block and year committees.
- Review of each course prior to its implementation by a subcommittee of the CC.
- Formal student evaluation of faculty and courses.

- Analysis of student performances on
  - USMLE examinations
  - NBME subject tests
  - second- and fourth-year clinical practice examinations
- Review of AAMC Graduation Questionnaire and residency performance data.

Brown University School of Medicine

STEPHEN R. SMITH, MD, MPH

Curriculum Management and Governance Structure

- The governance structure for the educational program at Brown University School of Medicine rests with the Medical Curriculum Committee (MDCC).
- A faculty member who serves a renewable five-year term chairs the MDCC.
- The MDCC recently underwent substantial revision of its structure to reflect the implementation of the competency-based curriculum, MD2000.
  - The chairs of the assessment committees for MD2000 were added to the MDCC as voting members.
  - The at-large membership to the MDCC was reduced to keep the overall membership at around 30.
  - Standing subcommittees for the basic science years, core clerkships, and clinical electives were created for horizontal and vertical integration.
  - The subcommittees on the basic science years and core clerkships have adopted a process for regular review of courses and clerkships.

Office of Education

- The Office of Curriculum Affairs was created in 1991 concurrent with the planning and implementation of the competency-based curriculum, MD2000.
- The office has primary responsibility for the implementation, monitoring, and evaluation of the competency-based curriculum and the overall curriculum.
- The office plans and conducts faculty development and supports a mentoring program for faculty to develop their teaching skills.
- The office conducts long-term program evaluation in conjunction with an external institutional curriculum-assessment committee.

Budget to Support Educational Programs

- Budgets are assigned for each course and clerkship, but generally do not include faculty salaries.
- In the last two years, the medical school has implemented a practice of compensating hospital-based faculty for teaching in the first two years of medical school based on a formula that reflects both effort and the quality of teaching. The funds for this are contributed by the teaching hospitals to the medical school.

Valuing Teaching

- The school has two tracks for full-time faculty: the research scholar track and the teaching scholar track.
- Although faculty in the research scholar track are expected to teach, the teaching scholar faculty regard teaching as their primary mission.
- Each department sets its own goals on the proportion of its full-time faculty on one or the other track.
- Criteria for reappointment and promotion on the two tracks reflect their different emphases.
- For promotion on the teaching scholar track, faculty must be excellent teachers and play leadership roles in teaching, such as serving as a course leader.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Brown faculty have defined the learning outcomes required of all students for graduation.
- The outcomes are reflected in the publication *An Educational Blueprint for the Brown University School of Medicine* (⟨http://biomed.brown.edu/Medicine_Programs/MD2000/blueprint.html⟩).
- The learning objectives consist of nine abilities and the knowledge base. The nine abilities are
  - effective communication
  - basic clinical skills
  - using basic science in the practice of medicine
  - diagnosis, management, and prevention
  - lifelong learning
  - self-awareness, self-care, and personal growth
  - the social and community contexts of health care
  - moral reasoning and clinical ethics
  - problem solving

- The learning objectives were defined using a nominal group process, a Delphi technique, and further refinement through working groups.
- The process is described in detail by Smith and Dollase in *Medical Teacher*, 1999;21:15–22.

Changes in Pedagogy

- The institution of our competency-based curriculum has resulted in significant changes in the pedagogic methods used.
- Each required course has responsibility for teaching not only the knowledge base in that discipline, but at least one of the nine abilities.
- Students are assessed using performance-based methods where they must synthesize the knowledge with the ability in order to perform at an acceptable standard of competence.
- The result of the changes is more active learning, more clinical relevance, and more nontraditional methods of teaching and learning, such as service learning, independent study, use of standardized patients, and group cooperative learning.

Application of Computer Technology

- Students are not required to own computers, but most do.
- Computer technology is reflected in the educational program through Web-based resources and course Web pages. (For example, five slides from each lecture in pathology are placed on that course's Web site.)

Changes in Assessment

- As described above, our competency-based curriculum has shifted the emphasis from traditional paper-and-pencil testing to performance-based assessment methods.
- Students are asked to *do* what they know, as reflected in:

  - more individual and group projects
  - self-reflective and interpretive writing such as journals
  - community service
  - use of standardized patients and OSCEs
  - practical exercises
  - case write-ups and presentations
  - higher-order-thinking test problems
- OSCEs are now used in most clerkships and a summative, multidisciplinary fourth-year OSCE has been instituted.

Clinical Experiences

- Students participate in clinical learning in hospitals, physicians' offices, neighborhood health centers, patients' homes, long-term care settings, hospices, occupational health clinics, planned parenthood clinics, HMOs, prisons, community centers, college health clinics, other community organizations and agencies, and the public health department.

Curriculum Review Process

- Plans for evaluation and review of the curriculum include
  - qualitative evaluation over the next five years by outside evaluation team(s)
  - student evaluations of courses and clerkships
  - monitoring of student achievement on performance-based assessments related to the nine abilities
  - residency program directors' ratings of graduates on the nine abilities
  - comparing practice patterns of Brown graduates with those of graduates of other schools

Future Goals

- The major themes for our school in the next five years will focus on
  - faculty development
  - student assessment
  - program evaluation
  - mechanisms to reward and compensate faculty
- In the area of faculty development, the school needs to enhance the faculty's skills in teaching the new competency-based curriculum, particularly in nontraditional areas such as lifelong learning; moral reasoning and clinical ethics; self-awareness, self-care and personal growth; and the social and community contexts of health care.
- Student assessment is closely linked to these faculty development efforts.
- The school needs to perfect and validate new methods of performance-based assessment.

- The program-evaluation effort will examine how successful our new competency-based curriculum has been in achieving its goals.
- The school must grapple with the new reality in health care financing in which health insurers implicitly subsidize medical education.

Medical University of South Carolina College of Medicine

AMY V. BLUE, PHD, VICTOR E. DEL BENE, MD, AND DAVID R. GARR, MD

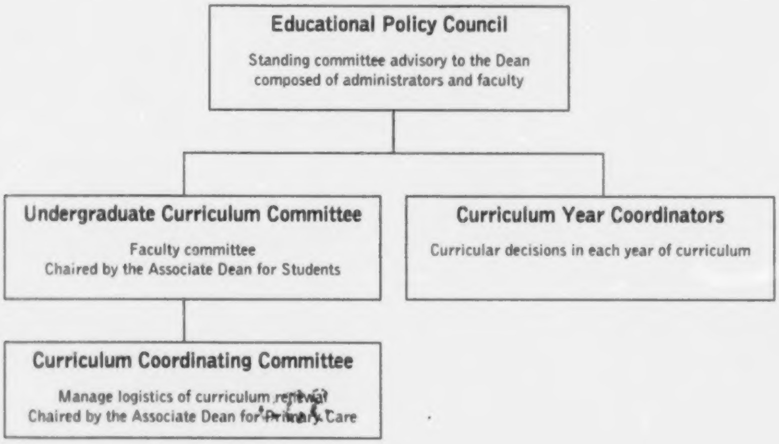
Curriculum Management and Governance Structure (See Figure 1)

- The Educational Policy Council (EPC) is composed of administrators and faculty who advise on all College of Medicine educational issues, including undergraduate, graduate, CME, and faculty development.
- The Undergraduate Curriculum Committee (UCC) is a faculty committee that addresses undergraduate medical education issues, including course changes, scheduling issues, student and course evaluation processes, LCME accreditation issues, and pertinent student affairs issues.
- The UCC is ultimately responsible for monitoring the effectiveness of the curriculum and approving substantive changes.
- The Curriculum Coordinating Committee (CCC) has the specific charge of managing the logistics of the curricular renewal for the College of Medicine undergraduate curriculum. It is charged with the responsibility for fostering meaningful integration of content and educational processes within and between the four years of the curriculum.
- Curriculum-year coordinators (a basic scientist and a clinical scientist for each year) are responsible for curricular decisions in each year of the curriculum (e.g., year two).
- Two doctoring-curriculum coordinators are responsible for the Doctoring Curriculum that spans all four years.
- The Curriculum Coordinating Committee is composed of the curriculum-year coordinators, the doctoring-curriculum coordinators, the associate dean for student affairs, the associate dean for primary care, the assistant dean for curriculum and evaluation, two medical students, and two resident physician graduates of MUSC.

Themes for Curriculum Renewal

- Increased integration of basic and clinical sciences throughout all four years, with emphasis on the basic science underlying clinical medicine
- Emphasis on self-directed learning and development of critical-thinking skills
- Use of multiple methods of learning and evaluation throughout all four years
- Use of comprehensive assessments to provide feedback to students about their performances and indicate areas for remediation
- Early exposure of students to patient care through primary care clinical experiences
- Emphasis on the preparation of a generalist physician

FIGURE 1: Curriculum Organization


Educational Policy Council
Standing committee advisory to the Dean composed of administrators and faculty
Undergraduate Curriculum Committee
Faculty committee
Chaired by the Associate Dean for Students
Curriculum Year Coordinators
Curricular decisions in each year of curriculum
Curriculum Coordinating Committee
Manage logistics of curriculum renewal
Chaired by the Associate Dean for Primary Care

- Development of an evaluation system to increase faculty and student accountability
- Development of students as medical professionals with effective interpersonal skills and knowledge of issues related to the delivery of health care
- Early and frequent contact between students and basic and clinical science faculty
- Emphasis on the use of information technology to access information and provide effective patient care

Curriculum before Renewal

Traditional 2 + 2 basic science and clinical medicine

Timeline for Process of Curriculum Renewal

- A preclinical, problem-based learning "parallel curriculum" was established in 1994 for 18 students to pilot a curricular innovation.
- The College of Medicine 1995–96 strategic plan included objectives for the undergraduate medical education program and identified competencies for medical school graduates.
- In the fall of 1997 and the early winter of 1998, "virtual" site visits were conducted with the University of New Mexico, Northwestern University, and the University of Pittsburgh to gather information about their curricula and processes they had used to introduce change.
- A retreat was held in spring of 1998 with the Educational Policy Council members and invited guests to discuss curricular change.
- Estimated date for full implementation of the new curriculum is the fall of 2000.

Design for Renewal Process

- Appointment of an associate dean for primary care and development of the Office of Primary Care, with a curriculum and evaluation coordinator to facilitate the change process
- Acquisition of information through "virtual" site visits from other medical schools that have changed their curricula
- Working groups charged to develop curricula and evaluation plans for the following curricular areas: physician–patient communication, human values and ethics, evidence-based medicine and continuous quality improvement, and health promotion disease prevention
- Retreat held with key stakeholders
- Curriculum-year coordinators named and the Curriculum Coordinating Committee established to manage the details of curriculum renewal

Planning and Implementation Resources Needed

- An Office of Primary Care with administrative support personnel to facilitate the curricular change process
- Funds to pay for "virtual" site visits and education consultants to visit MUSC
- Faculty time and sufficient faculty to teach small groups of medical students
- Funds and personnel to conduct faculty development programs
- Food for lunch meetings and retreats
- A defined educational budget

Strategies of Process

- Leadership by the dean
- Office of Primary Care established to facilitate change process
- Student involvement
- Establishment of task forces
- Appointment of respected, innovative educators as curriculum-year coordinators
- Realignment of education dollars
- Development of Center for Medical Education

Highlights

- Success of the "parallel curriculum" as an educational innovation and the demand for the addition of six more students to each year of the curriculum
- Establishment of the Center for Clinical Evaluation and Teaching (CCET)—the CCET provides space for conducting clinical performance assessments
- Implementation of a primary care, community-based experience for first-year students to provide them with early patient-care experience
- Implementation of a rural, interdisciplinary third-year clerkship that emphasizes students' application of the principles of community-oriented primary care and continuous quality improvement in the provision of health

care in rural, underserved communities in South Carolina

- Implementation of a comprehensive examination week that includes three study days, a day for the written comprehensive examination, and a day for the laboratory practical and clinical skills examination
- Introduction of a problem-based-learning component in the first-year curriculum
- Implementation of a clinical practice examination required of all students to pass before graduation, administered at the beginning of the fourth year

Challenges of the Process

- Faculty resistance to the need for curriculum change—"If it isn't broken, don't fix it."
- Fear of loss of autonomy in a more centralized curriculum structure among faculty and chairpersons
- Pressures on clinical faculty for clinical productivity

Plans for Evaluation of Change

- Evaluations by students of all courses, including use of liaison groups for formative feedback
- Evaluations by faculty of courses and assessments of faculty satisfaction with the curriculum
- Assessments of student satisfaction with the curriculum and quality of life during medical school
- Assessment of student performances on a clinical practice examination at the beginning of the fourth year
- Examination of USMLE performance
- Examination of NBME subject examination scores in third-year clerkships
- Examination of AAMC Graduation Questionnaire data
- Assessment of graduates' performances during residency by issuing questionnaires to residency directors
- Examination of graduates' specialty choices and the geographic distribution of practice locations
- Development of a system for measuring faculty performances, including the use of student, peer, and experienced senior faculty evaluations

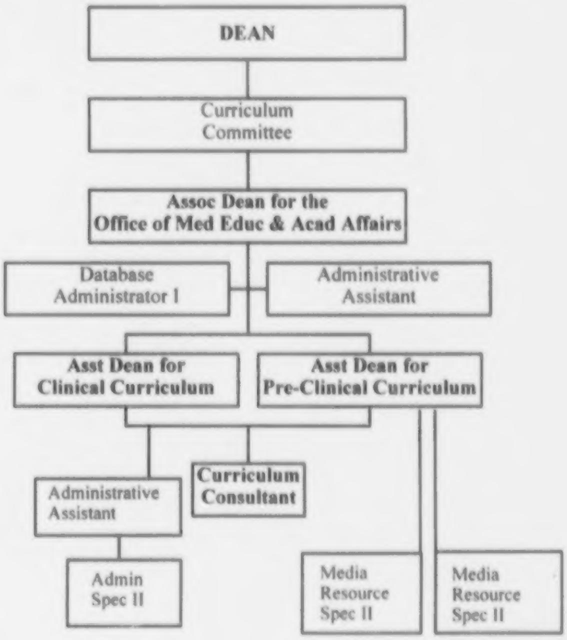
University of South Carolina School of Medicine

LARRY R. FAULKNER, MD, AND ROBERT F. SABALIS, PHD

Curriculum Management and Governance Structure

- In 1994, the dean of USCSM revised the organizational structure of USCSM by creating the Office of Medicine Education and Academic Affairs (OMEAA) with three component divisions (the Office of Admissions and Enrollment Services, the Office of Student Services, and the Office of Curricular Affairs and Faculty Support).
- The Office of Curricular Affairs and Faculty Support (OCAFS), staffed by the full-time assistant dean for pre-clinical curriculum and assistant dean for clinical curriculum and other administrative personnel, is responsible for the medical education program at USCSM (see Figure 1).
- In 1996, the dean and the USCSM faculty developed and approved revisions in the process of faculty governance at USCSM. These revisions clarified the authority of and membership on USCSM committees, established several new committees and discontinued or consolidated other committees, clarified the relationships of committees and subcommittees to various USCSM administrative offices, and enhanced the authority and independence of the USCSM Curriculum Committee. The newly "empowered" Curriculum Committee then initiated curriculum renewal efforts that continue to this date.

FIGURE 1. Department of Curricular Affairs



- In 1998, a half-time curriculum consultant (EdD in curriculum) joined the staff of the OMEAA to assist members of the Curriculum Committee, course and clerkship directors, and the assistant and associate deans in establishing/revising specific, objective, and measurable learning objectives for all required courses and clerkships.
- In 1998, a full-time database manager was hired in the OMEAA to improve the existing USCSM database and to assist with the implementation of the AAMC Curriculum Management Information Tool (CurrMIT) at USCSM.
- In 1999, a fourth division, the Office of Graduate Studies, was added to the OMEAA.
- In July 2000, a new division was created in the OCAFS, the Division of Diagnostic Education, and an already identified full-time director was appointed as assistant dean for clinical assessment.
- The assistant dean for clinical assessment is responsible for the operation of an expanded Standardized and Simulated Patient Program and for assisting clerkship directors in the development/revision of objective structured clinical evaluations (OSCEs) for the six required M-III clerkships. Four clerkships (family medicine, pediatrics, internal medicine, and psychiatry) have had OSCEs in place for several years; the remaining two clerkships (surgery and obstetrics–gynecology) will implement OSCEs for the first time during the 2000–01 academic year.

Office of Education

- Management and support of the USCSM medical education program are the responsibility of the OMEAA and, more specifically, of its component division, the OCAFS.
- The 1994 restructuring of these offices changed their names slightly and, more important, resulted in the assignment of two faculty members to full-time positions

(the assistant dean for preclinical curriculum and the assistant dean for clinical curriculum) in the OCAFS to replace the previous part-time assistant dean for academic affairs.

- The full-time nature of these positions reflected the increased authority and responsibility assigned to these positions, the desire for additional curricular renewal efforts, and the need for improved correlation and integration of the basic science and clinical science educational programs.
- With the construction of a new lecture hall in 1998 and the remodeling of an existing lecture hall the following year, positions for two full-time faculty support technicians were added to the OCAFS. These technicians assist faculty members with the utilization of new computer hardware and software in each classroom and with the creation of new teaching materials that take advantage of the computer and multimedia capabilities in each classroom.
- With the 1998 addition of the half-time curriculum consultant and the July 2000 addition of the full-time assistant dean for clinical assessment to the OCAFS, the number of faculty/administrators in that office was augmented and the curricular renewal efforts of the Curriculum Committee have received important additional assistance.
- A separate Office of Faculty Development and Continuing Medical Education (OFDCME) exists at USCSM to support faculty development activities in both educational and clinical arenas. The assistant dean for faculty development and continuing medical education and the professional and administrative members of his staff are responsible for the evaluation of individual faculty members' performances in their educational responsibilities; for administration of those faculty development activities approved by the USCSM Faculty Development Committee; and for planning and implementation of continuing medical education activities for USCSM faculty members and hospital professional and resident staff members.

Budget to Support Educational Programs

- The OMEAA and its component OCAFS are supported directly by the Office of the Dean with state-funded monies ("A" funds).
- Over the past decade, this budget has been expanded to include full-time salaries for all faculty administrators; these positions were previously funded on a part-time basis, with faculty staff members shared with USCSM basic science and clinical departments.
- This budget currently supports the salaries of all faculty/administrators and the curriculum consultant and database coordinator, the salaries of administrative staff positions (administrative assistant, 2.5 secretaries, and two faculty support technicians), and the costs of the four-semester, first- and second-year Introduction to Clinical Medicine course sequence and the USCSM Standardized and Simulated Patient Program.
- The OFDCME is jointly funded and administered by USCSM and the Palmetto Health Alliance, composed of Palmetto Richland Memorial Hospital and Palmetto Baptist Medical Center, both major USCSM-affiliated health care institutions located in Columbia, South Carolina.
- In July 2000, the budget was increased again to support the full-time salary of the newly appointed assistant dean for clinical assessment in the OCAFS.
- In addition to salaries, the budget supports the costs of educational activities in the two-year-long Introduction to Clinical Medicine course sequence; of faculty support activities (e.g., classroom staffing; revision of course handouts, overheads, and media; slide production); and of the purchase of mannequins and models and other equipment; and the payment of patients/actors for the Standardized and Simulated Patient Program.

Valuing Teaching

- Excellence in teaching among faculty members is recognized in many ways at USCSM. The OCAFS is responsible for program assessment (e.g., course and clinical clerkship evaluations); the OFDCME is responsible for evaluation of individual faculty members.
- Medical students evaluate each course and clinical clerkship and each faculty member at the conclusion of each course and clerkship by means of standard forms developed for those purposes.
- The course and clerkship evaluation forms permit students to identify those faculty members whose participation in the educational program has been extraordinary in some way.
- Medical students in each year of medical education nominate annually outstanding faculty members with whom they have come in contact; they then vote to select one "faculty member of the year" for each class. These faculty awards are presented annually at the spring semester School of Medicine Banquet.
- The Faculty Development Committee administers the USCSM Teaching Advancement Awards. These awards involve annual monetary awards, certificates, and public recognition of those faculty members who apply for the

award and who document their participation in various aspects of the USCSM basic and clinical science teaching program.

- There is a similar program for faculty members involved in research, the Research Advancement Award.
- In 1999, the dean's office initiated an annual faculty planning process during which each faculty member establishes an agreement with his or her supervisor (usually the department chair) regarding the proportions of his or her effort to be devoted during the upcoming academic year to the areas of teaching, scholarship/research, and service at USCSM.
- At the time of the next faculty evaluation, the degree to which the faculty member has met expectations in each area will be utilized as a beginning point for discussion between the parties regarding the amount of salary increase for the subsequent academic year and potential application for promotion to a higher faculty rank.
- During the commencement exercises for graduating members of the fourth-year class, the O'Neill Barrett Award for Teaching Excellence is presented to the three individual faculty members (one basic scientist, one clinician on the USCSM–Columbia campus, and one clinician on the USCSM–Greenville campus) selected by the members of the graduating class as having demonstrated teaching excellence at USCSM over the course of four academic years.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- During the past two academic years, each course and clerkship director has developed, with the assistance of the half-time curriculum consultant and under the direction of the appropriate subcommittees of the Curriculum Committee and personnel in the OCAFS, a set of course- and clerkship-specific, objective, and measurable learning objectives.
- The learning objectives relate to the previously established mission and goals of USCSM.
- During the current academic year, the learning objectives are being refined and examined to ensure that data are available to document the attainment of each objective, that learning objectives are comparable across courses and clerkships in number and variety, and that learning objectives have been identified for each relevant curricular component.
- Course and clerkship directors have, under the direction of the appropriate subcommittees of the Curriculum Committee and personnel in the OCAFS, reviewed the USCSM Technical Standards for Admission and Graduation. These standards, developed by the Curriculum Committee in response to the Americans with Disabilities Act of 1992 and approved by the Executive Committee, document those skills expected of candidates for admission and for receipt of the MD degree, vis-à-vis "sufficient intellectual capacity, physical ability, emotional stability, interpersonal sensitivity, and communication skills to acquire the scientific knowledge, interpersonal and technical competencies, professional attitudes, and clinical abilities required to pursue any pathway of graduate medical education and to enter the independent practice of medicine."
- After review of these standards, the course and clerkship directors met with departmental faculty members to delineate the minimum clinical skills required for successful completion of each course and clerkship.
- The departmental compilation of required clinical skills has been assembled and named the Technical Skills Attainment Document (TSAD). Successful completion of each course and clinical clerkship requires that each student perform the required clinical skills in the presence of a faculty member or senior resident, have the supervisor document mastery of the skill with his or her signature, and submit the completed TSAD prior to the conclusion of each course and clerkship.
- Completion and documentation of mastery of all required departmental and interdepartmental skills is also required for graduation from USCSM.

Changes in Pedagogy

- Various changes have taken place in pedagogy at USCSM over the past decade.
  - In some first- and second-year courses, the proportion of the course presented in small group and other active learning formats (e.g., problem-based, case-based, and facilitated discussions; community projects; student-peer teaching sessions) has increased significantly.
  - Material previously taught in a lecture format is now taught in more active and independent learning formats.
  - Clinical correlation conferences in basic science courses have increased in number and variety.
  - Computer-assisted and multimedia instructional technologies have been introduced in many first- and sec-

ond-year courses as a result of the renovations of the first- and second-year classrooms.

- The Standardized and Simulated Patient Program, initiated several years ago and expanded annually thereafter, utilizes numerous trained patients and actors to teach students medical interviewing, physical diagnosis, and interpersonal skills in various components of the first- and second-year Introduction to Clinical Medicine courses. These patients and actors also participate in the process of assessing medical students.
- In the spring 2000 semester, the final month of the second-year curriculum has been cleared of all didactic classes and laboratories so that ten teams of basic science and clinical faculty members can meet with small groups of second-year students in problem-based learning experiences.
- Cases have been created for these problem-based learning experiences and laptop computers acquired to present these case materials.
- Faculty members have been prepared for these pedagogic changes through regularly scheduled faculty development activities sponsored by the Faculty Development Committee and the OFDCME.

Application of Computer Technology

- In fulfillment of the fall 1999 recommendation of the Curriculum Committee, all students enrolling in the August 2000 entering class will be required to acquire laptop computers that meet specifications established by the Office of Computer and Communications Resources.
- During the 1998–99 academic year, the Office of Computer and Communications Resources was established, upon the advice of consultants, as a separate entity from the USCSM Medical Library, so that it could respond more effectively to the educational, research, and administrative needs of USCSM.
- The newly appointed full-time Director of Computer and Communications Resources and the members of his staff work collaboratively with the Director of Library Services and her staff.
- This office is also in the process of creating a wireless local area network (LAN) on the USCSM basic science campus, with a deadline date of summer 2000.
- The budget of the Office of Computer and Communications Resources has been expanded to create the wireless LAN.
- It is the goal of the Curriculum Committee, with support from personnel in the OCAFS and the Office of Computer and Communications Resources, to transfer, on a year-to-year basis beginning with the 2000–01 academic year, as many course-related instructional materials as possible (i.e., handouts, slides, syllabi, clinical case materials, etc.) to a computerized format.
- Ten laptop computers were acquired at the end of 1999 by the OCAFS to be used in the problem-based learning activities implemented for the first time in the second-year, spring-semester Introduction to Clinical Medicine in 2000.
- Clinical case materials (patient demographic data, laboratory data, skin and retinal images, x-rays, biopsy and autopsy microscopic images, and other information) have been loaded on these computers for all problem-based learning cases that have been developed for this course.

Changes in Assessment

- USCSM established a Standardized and Simulated Patient Program several years ago under the direction of faculty members in the Department of Internal Medicine. In July 2000, this program will be reassigned to the newly established Division of Diagnostic Education in the OCAFS. The reassignment of the program to the USCSM central administration in the OCAFS recognizes the importance of the program to many USCSM courses and anticipates the need for additional behavioral and in-vivo assessment of students in core clinical clerkships in the third and fourth years.
- The program is operated in conjunction with the School of Theater, Speech, and Dance of the University of South Carolina and has already been of significant benefit to the Medical Interviewing and Physical Diagnosis components of the first- and second-year Introduction to Clinical Medicine courses and to OSCEs in the departments of internal medicine, neuropsychiatry and behavioral science, family and preventive medicine, and pediatrics.
- Computers have not played a large role to date in assessment procedures at USCSM. With the introduction of laptop computers for incoming first-year students in August 2000, computers will undoubtedly play a larger role in the educational and assessment processes in the future, although no specific plans have been developed at this time.
- Required faculty observation of students' mastery of basic and advanced clinical skills have been reinforced at the school during the past five years.
- OSCEs have been a component of the final grades in four of six core third-year clinical clerkships for several years at USCSM. During the current academic year, the Curriculum Committee has determined that all core third-year clinical clerkships must have OSCEs in place

during the 2000–01 academic year. The assistant dean for clinical assessment Division of Diagnostic Education of the OCAFS is responsible for training personnel in these final two clinical clerkships to develop and implement OSCEs in their departmental clerkships and to assist faculty members in the other four departments to expand and improve their already existing OSCEs.

- The Curriculum Committee has required that all core third-year clinical clerkships use NBME subject examinations as one component of students' final grades, beginning in the 2000–01 academic year, in order to document the performances of USCSM students vis-à-vis national standards.
- All but one clinical clerkship has already made use of NBME subject examinations; this core third-year clerkship will begin using NBME subject examinations during the 2000–01 academic year.
- During the past decade, the school established a requirement that all students be evaluated in personal and professional conduct during all third- and fourth-year clerkship and elective experiences.
- In the last two years, personal and professional conduct assessment has also been expanded to first- and second-year courses. This policy was created because members of the faculty and the dean agreed that academic knowledge, clinical skills, and appropriate personal and professional attitudes and conduct should be expected of all students and that, therefore, all three aspects of performance should be specifically evaluated. Any student receiving an unsatisfactory assessment in any aspect of personal and professional conduct receives a grade of Incomplete for the educational experience. This Incomplete grade can be removed only after the student has remediated the problem identified to the satisfaction of the course/clerkship director. A second unsatisfactory assessment results in the student's being "subject to dismissal" by the USCSM Student Promotions Committee and the dean.

Clinical Experiences

- As a community hospital-based medical school, USCSM provides core clinical training experiences for its students in a variety of clinical facilities. These include inpatient units and outpatient clinics associated with four clinical institutions: the Palmetto Health Alliance (the Palmetto Richland Memorial Hospital and the Palmetto Baptist Medical Center), the Dorn Veterans Affairs Medical Center, the Greenville Hospital System (GHS), and the William S. Hall Psychiatric Institute (the teaching hospital of the South Carolina Department of Mental Health).
- The GHS program, initiated in 1990, permits 12 third-year and 12 fourth-year students per academic year to complete core clinical training on that campus in Greenville, South Carolina, 90 miles from the main campus in Columbia. These 24 students participate in equivalent academic and clinical experiences provided by USCSM-GHS faculty members under the direction of USCSM–Columbia department chairs, clinical clerkship directors, and academic administrators.
- USCSM has, through careful planning, arrived at a 50% inpatient/50% outpatient balance for these core clinical experiences in the third and fourth years of medical education during the past decade.
- Students on various core clinical clerkships complete required clinical experiences in the offices of physicians in private practice (four weeks of the eight-week family medicine clerkship and during the neurology clerkship); at community mental health centers, drug and alcohol treatment facilities, Alcoholics Anonymous meetings, and forensic psychiatry units (the psychiatry clerkship); in state-supported institutions for children and in the homes of children with developmental disabilities (the pediatrics clerkship); and at the Columbia Free Medical Clinic (the second-year Introduction to Clinical Medicine course).
- The opportunity to complete a month-long rotation in the third year with a family physician in practice in a rural area of South Carolina is available to medical students.
- Beginning in July 2000, this four-week Deans' Rural Rotation Month will become a third-year requirement for students at both USCSM and our sister institution, the College of Medicine at the Medical University of South Carolina in Charleston, South Carolina. Both medical schools have developed sufficient numbers of rural medicine sites to accommodate the 200+ medical students completing this educational requirement at both institutions.

Curriculum Review Process

- The Curriculum Committee has an established process whereby, on an every-five-year basis, one year is spent reviewing first- and second-year courses, another year is spent reviewing third-year clinical clerkships, and a third year is spent reviewing the five vertical curricula at USCSM (nutrition, medical ethics, substance abuse, geriatrics, and genetics).
- The Curriculum Committee, through its various subcom-

mittees, establishes basic scientist/clinician teams to review each curricular element by means of a standard questionnaire developed and approved by the committee.

- Themes and goals for the curriculum:
  - the quality of the orientation program for the course/clerkship
  - the quality and specification of educational objectives (e.g., course content and its prioritization, horizontal and vertical integration of the course/clerkship, clinical relevance of the material taught, presence of outcome-based learning objectives)
  - educational methods, activities, and settings (e.g., opportunities for independent learning, problem-based learning, and case-based discussion; use of computer-assisted instructional materials; use of standardized and simulated patients for instruction and evaluation; settings for educational/clinical activities; coordination of clinical experiences across clinical campuses; numbers of new patients/week; presence of student clinical logs)
  - student feedback and evaluation (e.g., course/clerkship/faculty evaluation methods, methods/frequency of student assessment, implementation of GPEP recommendations and LCME accreditation standards)
  - outcome indicators (e.g., grade distributions, use of NBME subject examinations)
  - strengths, weaknesses, and needs of the course/clerkship (e.g., anticipated changes, resource allocation, computer hardware/software needs, other needs)
- The process
  - Two-person teams of Curriculum Committee members (one basic scientist and one clinician) evaluated each course, clerkship, and vertical curriculum. One academic year was devoted to the assessment of first- and second-year courses, one academic year to the assessment of third- and fourth-year core clinical clerkships on the Columbia and Greenville Hospital System campuses, and one academic year to the assessment of vertical curricula.
  - Each course/clerkship/vertical curriculum director received the standard questionnaire approximately two months before the assessment team scheduled an individual meeting with him or her. At this meeting, team members discussed questionnaire responses with the director and requested additional information, when necessary. Each team then reported its results to the appropriate subcommittee of the Curriculum Committee.
  - Additional information was acquired from the clerkship director and/or department chair, if necessary, prior to the subcommittee's making its report and recommendations to the full Curriculum Committee.
  - The Curriculum Committee's recommendations were then forwarded to the dean, the department chair, and the course/clerkship director. The dean then discussed implementation of these recommendations with the department chair at their quarterly meeting. The department chair and course/clerkship director then informed the members of the Curriculum Committee about the timetable for implementation of recommendations.
  - Resources for planning of this curricular renewal effort were limited to the usual resources allocated to the Curriculum Committee, the OMEAA, and the OCAFS.
  - When additional resources were required for implementation of recommendations for other central administration-supported educational activities (e.g., expansion of the Standardized and Simulated Patient Program and creation of the Office of Computer and Communication Resources), these resources were forthcoming from the Office of the Dean through the annual USCSM strategic planning and resource allocation processes.
- Challenges:
  - The major challenges in the curricular review/renewal process were the time involved in the process for members of the Curriculum Committee and personnel in the OCAFS and the occasional difficulty faced in convincing a relatively small number of course directors and department chairs of the need for, and the advisability of, revising and renewing their courses.
  - The time commitment for this process was quite substantial at times, especially in light of the time required for the other ongoing activities of the OMEAA and the OCAFS. The hiring of a half-time curriculum consultant was helpful in this regard as she facilitated course and clerkship directors' efforts in responding to the renewal process and implementation of recommendations.
  - The difficulty involved in convincing some course directors of the need for curricular renewal efforts in their departmental courses continues, although progress has been made. The "empowerment" of the Curriculum Committee and the ongoing and significant support of the dean are two significant factors in the success to date of renewal efforts.

Evaluation of Curriculum Renewal

- Since the changes made in the basic science curriculum have taken place only relatively recently and since changes in the clinical and vertical curricula are ongoing, it may be several years before the full impact of these curricular changes can be fully assessed (i.e., by means of student and faculty feedback, performances in clinical clerkships, achievement on OSCEs, scores on NBME subject and Step 1 and 2 examinations, reports from graduates and their residency directors).

- The Curriculum Committee is currently completing its third year-long cycle of curricular review and renewal; the next two years will be spent in assessing fully the impact of changes made.
- The Self-Study Process required for the next LCME accreditation site visit began in the summer of 2000; this year-long effort will provide an excellent opportunity for comprehensive assessment of the basic science and clinical curricula at USCSM, with an opportunity for fine-tuning curricular renewal efforts based upon analyses of the outcome data collected.
- Historically, the process of ongoing review of the educational program at the school involves a five-year cycle: one year for assessment of the first- and second-year educational program; a second year for assessment of the third- and fourth-year educational program and implementation of changes in the basic science curriculum; and a third year for assessment of vertical curricula and implementation of changes in the clinical curriculum, followed by two years of implementation of changes in the vertical curricula and of other recommendations, coordination of programmatic changes, and assessment. Since this timeline also approximates the schedule for LCME accreditation site visits, the two efforts complement and support each other.

Future Goals

- During the next review process, attention probably will be paid to
  - the role of computers in the medical education program
  - the expansion of topics in the curriculum related to professionalism
  - medical ethics and the medical humanities
  - improvement in the planning for, and implementation and assessment of, the five current vertical curricula
  - the possible creation of a sixth vertical curriculum in complementary and alternative medicine
  - the expansion of behavioral assessment of students in both basic science courses and clinical clerkships and electives
  - the continuing challenge of expanding active and independent learning opportunities and clinically relevant basic science course work
  - further enhancement of lateral integration, independent learning, and behavioral assessment in the preclinical curriculum

University of South Dakota School of Medicine

ROBERT RASZKOWSKI, MD, PHD

Curriculum Management and Governance Structure

- The Dean of Academic Affairs was appointed in response to the Faculty Council's request and to external recognition of the need for an individual other than the dean to have central administrative responsibility for the curriculum.
- The Curriculum and Evaluation Committee (C&E Committee) was reconstituted to be less department/discipline-specific.
- The C&E Committee was later replaced by a smaller, even more general Education Committee to set general school-wide educational direction and policy.
- Year-specific subcommittees have been formed and are actively pursuing horizontal and vertical integration of the curriculum.
- The clinical curriculum is planned and managed centrally, but is implemented, with the help of campus deans, at the school's three clinical campuses.

Office of Education

- There is currently no office of education at the school, although the creation of such a group to support the Dean of Academic Affairs is under way.

Budget to Support Educational Programs

- There is a specific program budget for the school from state funds and medical student tuition.
- There is no discrete portion of the budget designated specifically for medical student education.
- The Ambulatory Center of Excellence has a specific budget that was obtained by the reallocation of existing state school of medicine monies at the start of academic year 1996–97.

Valuing Teaching

- No formal school-wide recognition program exists for faculty whose primary responsibility is the medical student education program.
- Selected clinical departments present recognition awards at their departmental recognition dinners.
- Students select outstanding teachers at the end of their basic science curriculum and at graduation.
- The incentive portion of raises from state funds may be used centrally or by departments to reward teaching excellence.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In the mid-1990s the C&E Committee developed global objectives that students should demonstrate at the time of their graduation. These objectives are
  - completion of medical school in four years
  - achievement of passing scores on USMLE I, II, and III on first attempt
  - preparedness to enter a generalist career in South Dakota
  - obtaining residency in the field of choice
  - commitment to lifelong learning
  - ability to conduct and present (verbally and in writing) a complete history, physical, and diagnostic/therapeutic plan
  - effective communication with patients, peers, and the public
  - understanding and practice of ethical decision making
  - understanding of major trends in health care delivery
  - comfort working in small groups
  - ability to assess and critically evaluate the medical literature and patient care data electronically
- The new Education Committee has begun, as its initial work, an extensive expansion and revision of the school's learning objectives, stimulated by the Medical School Objectives Project and the Continuum of Competency developed by the Accreditation Council for Graduate Medical Education and the American Board of Medical Specialists.

Changes in Pedagogy

- There has been a significant shift in the location of clinical education, especially in the third year, from inpatient to outpatient settings.
- The third-year experience at one campus is based entirely in an ambulatory setting (Yankton Model Program), while the other two clinical campuses have weekly longitudinal ambulatory experiences in primary care settings throughout the third year.
- Traditional third-year clerkships have been coupled to allow for horizontal integration and to provide for a greater longitudinal outpatient clinical experience within disciplines.
- To span issues created by a distance (400 miles between campuses) and time zones (Central and Mountain Time within the state), much of the didactic material in the third year is now Web based.
- Each year since the mid 1990s, there has been a consistent movement within the basic science disciplines to introduce specific subject matter using clinical vignettes, to decrease didactic lectures, and to move learning to interactive small-group experiences.
- Standardized patients are used in the teaching of physical diagnosis skills in the second year, in the third year obstetrics–gynecology rotation, and in the school-wide OSCE at the end of the third year.
- Faculty development in the creation and use of standardized patients is currently under way.

Application of Computer Technology

- Students are not required to have laptop computers, but are required to use computers throughout the curriculum.
- All students are assigned Internet accounts and participate in medical informatics orientation during the initial week of their first year.
- Dial-up Internet access is available on all campuses.
- Optional, formal learning opportunities are available to students, faculty, and staff in the areas of office productivity software, Internet, literature searching, and educational technologies.
- On-line asynchronous Web-based instruction is used in the first three years of the curriculum, with the greatest use in the third year.
- On-line instruction includes text, video, and image materials for didactics, small-group patient-based exercises, and testing and evaluation.
- Third-year students participate in a required two-hour workshop on presentation techniques and distance learning during orientation to the third year.
- Evidence-based medicine is a ten-hour instructional module in the family medicine junior clerkship.
- The curriculum for the first two years of the undergraduate medical education program have been entered into the AAMC's Curriculum Management and Information Tool (CurrMIT).

Changes in Assessment

- The use of standardized patients has increased over the past few years in the school-wide OSCE given at the end of the third year.
- With a faculty development program in the use of standardized patients now completed, there will be increased use of standardized patients in third-year clerkship evaluations, starting in obstetrics–gynecology.
- A pre-matriculation computer literacy assessment is administered to all students to track their skills and awareness.
- Web-based clinical experience database logs are maintained by students in the third year and will be expanded for use in other years beginning in the next academic year.
- The database tracks all meaningful diagnostic and procedural patient encounters in all courses, including longitudinal ambulatory care clinics to document student experiences and provide a mechanism to measure comparability between campuses, courses, clinical sites, and clinical faculty.
- On-line assessment instruments have been developed using a Web-deliverable database system for academic leadership evaluation, course-related evaluations, and curriculum-based student evaluations.
- A school-wide OSCE was begun five years ago and is administered to all students at the end of their third year.
- Students falling below an expected level of performance are counseled by the academic dean and must justify how they plan to correct their deficiencies through their current or modified fourth-year schedules or through independent study.

Clinical Experiences

- Students' clinical experiences now begin in the first year within the Introduction to Clinical Medicine (ICM) course as students interact with patients in various age groups within the biopsychosocial model.
- Experiences build during the physical diagnosis component of the second year of ICM. The experiences take

place in a variety of settings, including nursing homes, clinics, individual practitioners' offices, and hospitals.

- At the end of the second year, each student spends one month in a rural family medicine preceptorship. The program has been in existence for over 50 years and sets the stage for the required family medicine experiences in the third and fourth years. This continued experience in family medicine has resulted in the highest rate of students entering family practice of any U.S. medical school, as judged by the receipt of the Gold Achievement Award from the Academy of Family Physicians consecutively for the last five years.
- Students are at one of three clinical campuses throughout their third year. At the Yankton campus, the entire third year is a student-centered experience that is based in a single ambulatory clinical setting.
- At the other two clinical campuses, students are in physicians' offices during most rotations.
- Students spend time in most clerkships in a hospital setting as well. The students typically work with a single clinical faculty member rather than being assigned to a ward or teaching service.
- During the fourth year, student experiences are widely varied by subject matter and setting in the elective half of the year.

Curriculum Review Process

- The curriculum has been reviewed regularly by individual courses at monthly mettings of the C&E Committee. The process allows the committee to look at the course content and outcomes/evaluation of each course by course/department-generated written or verbal presentation. The limitation of this process was that it has not incorporated defined mechanisms for horizontal or vertical change and thus changes have been slow, except where dictated by the School's administration.
- Without a strong mechanism to dictate change, curricular elements that were not discipline-specific (e.g., ethics/professionalism, domestic violence, nutrition, practice management) have been difficult to place in the curriculum.

East Tennessee State University James H. Quillen College of Medicine

DANIEL J. WOOTEN, MD AND PENNY L. SMITH, EdD

Curriculum Management and Governance Structure (See Figure 1)

- The Medical Student Education Committee (MSEC) was constituted in 1993 to replace a large departmentally-based curricular governance committee.
- The MSEC was composed of individuals who volunteered to spend a considerable portion of their time implementing the generalist curriculum and developing opportunities for vertical and horizontal integration.
- In 1996, the membership of the MSEC was modified to increase the number of clinical faculty, to be more representative of the teaching faculty at large.
- The MSEC leadership changed from having a chair to faculty co-chairs, one being a clinician and the other a basic scientist.
- The MSEC has the option of appointing ad-hoc committees to address specific issues, and frequently has multiple working groups of faculty and students delving into curricular issues and making recommendations for the MSEC's consideration.
- The design of recently implemented curricular revisions has been heavily influenced by recommendations from these working groups.
- The MSEC utilizes inputs from a variety of sources (faculty, students, and administrators; working groups; and results of course and program evaluations) to set its agenda.
- The recommendations of the MSEC are forwarded to the dean and/or executive associate dean for approval.
- Major changes are brought to the faculty at large and to the department chairs for consideration.
- Once approved, changes are implemented through the executive associate dean, department chairs, and course directors.
- Data from course and program evaluations come back to the MSEC for analysis and subsequent use in curricular decision making.

Office of Education

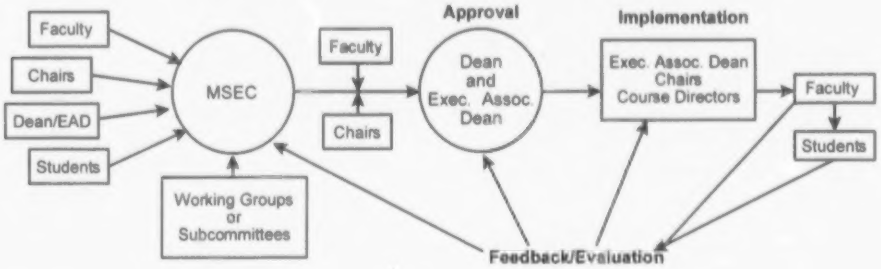
- Daily educational support for the reform effort has been provided through the educational support staff of the Office of Academic Affairs.
- The staff within that office has approximately doubled within the last five years.
- The expanded and more complex responsibilities required new staff with substantially higher educational credentials.

CURRICULUM RENEWAL PROCESS

Guiding Principles

- Adults learn best when information and concepts are presented in context.

FIGURE 1: Curriculum Governance Structure



- Integration of basic and clinical sciences should occur throughout the curriculum.
- Learning in medical education should be active and student-centered.
- The curriculum should prepare students to be lifelong learners and critical thinkers.
- Clinical integration should occur early in the educational process.
- The differing learning styles of students should be considered when developing educational experiences.

History of Change

- Prior to curricular renewal efforts, the curriculum had the following features.
    - The curriculum during the first two years was primarily department-based and lecture-driven, with most content decisions made within departments.
    - Preceptorship experiences for traditional-track students were limited to two weeks during the first two years in primary care offices.
    - The Kellogg rural primary care track offered an exception to students who spent extended periods of time in rural health care settings over a period of four years.
- In 1991 East Tennessee State University received one of seven national grants awarded by the W. K. Kellogg Foundation to develop a model community-based educational program that emphasized an interdisciplinary approach to primary health care delivery.
- The Community Partnership Program that emerged was the product of a collaborative effort between the colleges of medicine, nursing, and public and allied health, and focused on two rural underserved Appalachian counties in northeast Tennessee.
- In 1995 the MSEC completed a vertical review of the curriculum.
- In 1996 the executive associate dean for academic and faculty affairs charged the MSEC with (1) integrating the basic medical sciences and clinical sciences across years one to four, (2) decreasing lecture hours while increasing independent study time, case-based/problem-based learning experiences, and computer-assisted instruction, (3) developing longitudinal curriculum themes, and (4) reviewing the existing evaluation process.
- In 1996–97 lecture hours were reduced and topics were aligned for the first two years. A one-day faculty retreat was held to discuss curricular issues.
- In 1997–98 computer-based diagnostic reasoning skills were added, lecture hours were further reduced, and alignment continued.
- Faculty working groups organized by the MSEC addressed issues relating to curriculum and evaluation. A comprehensive program evaluation plan was developed.
- A four-day faculty retreat (attended by 75 faculty and 23 students) was held to reach consensus on curricular reform recommendations.
- In 1998–99 the dean charged the MSEC with (1) determining the best curricular model for moving the integration effort forward, (2) finalizing the system for periodic review of clerkships and courses, (3) assessing the educational experiences in years three and four, (4) refining the process for documentation of commencement objectives, and (5) developing a "health focus" for the curriculum.
- Comprehensive faculty development was provided to develop small-group teaching skills.
- Problem-based learning experiences were dramatically increased during the first two years. Faculty and student working groups continued to address specific curricular issues.
- In 1999–00 the two-week preceptorship experience continues but has been expanded to permit students additionally to spend one afternoon per week in a primary care physician's office for one semester during their first year.
- A retired physicians group composed of 18 retired doctors was formed and began meeting every two months with interested students over lunch to discuss real-life practice issues.
- Contact hours in Practicing Medicine, a two-year course that provides clinical linkages to basic science coursework, have more than doubled and have required increased participation by both clinical and basic science faculty.
- Plans for 2001–02 include the beginning of a new, more comprehensive curriculum revision with even greater emphasis on integration.

Changes in Pedagogy

- Before the reform effort, education in the first two years was primarily lecture-driven.
- As a result of ongoing curricular change, lecture time has decreased in almost every course, with a substantial increase in problem-based and small-group learning experiences.
- Faculty were initially trained to facilitate problem-based learning by a consulting team from another institution.
- A need for additional training was identified by the faculty, and as a result The Teachers Group was formed.

Members of this group met regularly to practice and enhance their teaching abilities in small-group settings.

- Standardized patients and objective structured clinical examinations have been utilized in the Practicing Medicine course.

Application of Computer Technology

- Entering students are now required to have laptop computers.
- Prior to the increased emphasis on instructional technology, access to computers was limited for both faculty and students.
- With a substantial increase in the number of computers, faculty commonly place course notes and slides on the intranet Web site.
- Some faculty have developed self-instruction modules available on the Web. Each seat in the student classrooms under construction in the new basic science building will have a power outlet and direct access to the intranet and the Internet.
- The Medical Imaging and Design Laboratory was created and dedicated to assisting faculty and students to develop needed computer skills.
- A computerized clinical log has been developed to track student clerkship experiences and identify experiential gaps that need attention.
- The MSEC is currently identifying ways to increase the basic science presence in the clinical years.

Changes in Assessment

Evaluation instruments for third- and fourth-year clerkships are being revised following successful use in a departmental pilot study.

Curriculum Review Process

- The strategies used successfully in the curricular renewal activities included:
    - the use of multiple working groups of faculty and students to address issues and make recommendations
    - extended faculty–student retreats
    - reorganization of the MSEC to increase clinical faculty and student representation
    - having co-chairs for the MSEC (one clinician and one basic scientist)
- Highlights and unanticipated outcomes of the process include
    - increased faculty interaction
    - increased faculty–student interaction relating to curricular issues
    - increased focus on the teaching–learning process
    - development of longitudinal preceptorships
    - a broader spectrum of learning experiences available for students with different learning styles
- The curriculum will be reviewed using
    - student evaluations of courses and clerkships
    - student feedback teams for each course
    - external standardized exam performance (USMLE and NBME subject exams)
    - faculty assessment of students
    - AAMC Graduation Questionnaire feedback
    - feedback from residency directors regarding performance of graduates
    - meetings with class officers
    - MSEC student representatives' feedback
    - individual structured interviews with various subsets of stakeholders (students, faculty, course directors, chairs, other administrators)
    - tracking of career choices and residency placements
    - assessment of adequacy of resources needed to enhance program change
    - systematic review of curriculum to determine increases in experiences that promote independent lifelong learning
    - student advancement and graduation rates

Future Challenges and Goals

- Continued faculty resistance to change ("If it's not broken, why fix it?" attitude).
- Perceived threats to departmental autonomy and control.
- The need to recruit faculty for small-group teaching.
- Developing the institutional consensus needed to move forward with sustained curricular renewal.

University of Tennessee College of Medicine

RICHARD PEPPLER, PHD, AND JOHN BOKER, PHD

Curriculum Management and Governance Structure (See Figure 1)

- The Committee on Undergraduate Medical Education (CUME) is advisory to the dean on educational issues.
- The Biomedical Sciences Subcommittee (BSS) addresses educational issues such as course changes, scheduling issues, and student and course evaluation processes pertinent to the first two years of the curriculum.
- The Clinical Sciences Subcommittee (CSS) addresses educational issues pertinent to the clinical component of the curriculum.
- The dean recently charged the CUME to undertake a two-year review of the courses and clerkships in the curriculum, with special emphasis on integration of content and student evaluation.

Office of Education

- The College of Medicine at the University of Tennessee does not have an office of education support. All of this support is provided by the Office of Academic and Faculty Affairs.

Budget to Support Educational Programs

- A separate budget for the educational programs in the first and second years was established in 1985.
- The funds are provided by the dean through the Office of Academic and Faculty Affairs.
- Funds are also provided in the same manner to some clinical departments for standardized patients and teaching assistants.

Valuing Teaching

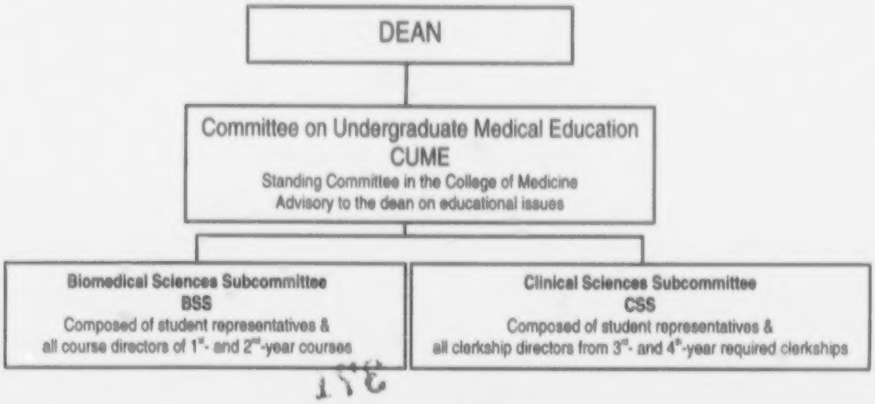
- In 1999, a campus-wide program known as the Academy for Distinguished Teachers was established. Only the most outstanding teachers are inducted into this academy. Each plays an important role in helping young faculty to become more effective teachers.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The faculty have had learning outcomes for the entire educational program for many years.
- During 1999–2000, faculty in each course and clerkship identified the educational goals and objectives for their respective programs.

FIGURE 1: Governance Structure


DEAN
Committee on Undergraduate Medical Education
CUME
Standing Committee in the College of Medicine
Advisory to the dean on educational issues
Biomedical Sciences Subcommittee
BSS
Composed of student representatives &
all course directors of 1st- and 2nd-year courses
Clinical Sciences Subcommittee
CSS
Composed of student representatives &
all clerkship directors from 3rd- and 4th-year required clerkships

Changes in Pedagogy

The Longitudinal Community Program represents the most significant change in pedagogy at the college of medicine.

- With the matriculation of the class of 2003, the Longitudinal Community Program was launched.
- This program took the existing courses of Behavioral Science, Preventive Medicine, Nutrition, and Introduction to Clinical Skills from the first and second years of the curriculum and combined them with community experiences and precepting experiences in the community. The program is presented in a week-long format, with the first week of each exam block in the first year and the last week of each exam block in the second year of medical school devoted entirely to the Longitudinal Community Program.
- There are a total of six weeks of the program in the first year and four weeks in the second year. Sixteen hours of the week are spent by the students in the community. At least eight of these hours are with one of 130 preceptors who were recruited during the summer. Over 70% of these preceptors are primary care practitioners. The additional eight hours are spent by the students working with various community agencies. Every student is required to identify a problem, develop an appropriate intervention, provide that intervention, collect data as to the effectiveness of the intervention, and present the project in poster format at the end of the second year. Another afternoon of this week is devoted to instruction in taking a history and performing a physical exam under the direction of one of the full-time faculty and fourth-year students. Other topics presented during the week include concepts from behavioral sciences, preventive medicine, nutrition, women's and children's health initiatives, and ethics. Many of these concepts are presented in small-group format as clinical cases.
- The students' attainment of clinical skills is evaluated utilizing standardized patients at the end of the first and second years.

Application of Computer Technology

- Students have not been required to have computers.
- More and more courses and clerkships are incorporating computer technology into their offerings.
- In 1999 a computer testing center was established in the college of medicine.
- All examinations in second-year courses and several in the first year are administered via computer.

Changes in Assessment

- The college has initiated a process whereby all examinations in the second year and several in the first year are administered by computer.
- Standardized patients have been utilized in the past, but their use as an assessment method will be increased with the class of 2003.
- Both standardized patients and OSCEs will be incorporated as assessment methods at the ends of the first and second years and within certain clerkships in the third year.

Clinical Experiences

- In addition to the clinical experiences students now have in the Longitudinal Community Program in the first and second years, students have 20 months of clinical clerkships in the third and fourth years in hospitals and offices in Memphis, Chattanooga, Jackson, Knoxville, and Nashville.
- Several months of clinical clerkships are spent in physicians' offices throughout the state. The college of medicine is truly a state-wide institution.
- Over 50% of the 20 clinical months are spent by the students in ambulatory settings.

Curriculum Review Process

- All courses and clerkships were reviewed in the self-study conducted in preparation for the LCME site visit in 1998.
- With faculty developing core learning objectives, the dean has asked the members of the CUME to begin an in-depth review of the educational program. This will be done as a two-year project, with special emphasis on course and clerkship integration and student assessment.
- The CUME and its subcommittees, the BSS and CSS, are responsible for on-going review of the entire educational program.

Vanderbilt University School of Medicine

GERALD S. GOTTERER, MD, PHD, GEORGE BOLIAN, MD, DEBORAH C. GERMAN, MD, AND JOHN E. CHAPMAN, MD

Curriculum Management and Governance Structure

- A collaborative process of evaluation and renewal has evolved to assure continuing improvement in all components of the core curriculum.
- Key components in the process are the Student Curriculum Committee, composed of elected members from each class and additional student volunteers; the Academic Program Committee, composed of faculty members appointed by the dean and the elected members of the Student Curriculum Committee; and the course directors.
- There have been retreats and workshops of the faculty and students to consider the overall curriculum. These sessions have benefitted from the involvement of national leaders in medical education.
- The outcomes of the retreats and workshops have led to modifications that include the introduction of more in-depth research experiences for all students, required ambulatory clerkships, a new course on nutrition, and a commitment to enhance education relating to cultural competence and other aspects of the doctor–patient relationship.

Office of Education

- In 1998 Vanderbilt University established the Center for Teaching as a university-wide resource to enhance the quality of teaching throughout the university.
- The center has collaborated with the dean's office of the school of medicine to sponsor a variety of programs for faculty and residents to improve teaching at the bedside, in small groups, and in lecture format.
- The center works directly with departments to strengthen faculty's and residents' skills in teaching and learning.

Valuing Teaching

- The students and the school recognize those faculty and residents who have distinguished themselves in the contributions they have made to the educational programs of the school.
- The students have had a longstanding award for the faculty member chosen by the fourth-year class who has made the most significant contribution to their education as undergraduate medical students.
- In recent years, the Student Curriculum Committee broadened the array of teaching awards made by the students in order to recognize the large number of persons they identify as having made significant contributions to their education.
- Recognizing that teaching in a medical school environment occurs in various formats, not all of which are readily identified by students, the school has established a new series of teaching awards. These awards recognize teaching in (1) lecture format, (2) small-group format, (3) the clinical setting with medical students, (4) the clinical setting with residents, and (5) mentoring in the laboratory. The recipients of these awards are selected by committees of faculty from nominations made by faculty. They are associated with monetary awards.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- At a curriculum retreat, the faculty and students recognized the need to identify more explicit learning objectives for the educational program.
- The Academic Programs Committee used the AAMC's Medical School Objectives Project (MSOP) and adopted some, modified others, and supplemented the list with some objectives of its own. The committee identified a total of 30 objectives for the educational program at Vanderbilt.
- These objectives were endorsed by the Executive Faculty of the School of Medicine.
- Adoption of the objectives led to a critical assessment of the extent to which the objectives are addressed in the formal and informal curriculum and the degree to which the faculty were assessing or could assess the achievement of these objectives.

- The assessment led to a modification of how students are evaluated during the clinical phase of the educational process.

Changes in Pedagogy

- Vanderbilt has long had a highly valued elective curriculum in the first two years. Three afternoons per week are allocated for elective experiences throughout most of the first two years. With the encouragement of faculty, students have increasingly used this elective time for student-initiated experiences that involve faculty for guidance and mentoring. These experiences have most commonly had a research or community service orientation, have involved students either individually or in groups, and frequently have been pursued in subsequent elective periods or over summer breaks. Faculty view such student involvement in the design of their own education as an important stimulus to a commitment to lifelong learning and also as reinforcement of most Vanderbilt students' interest in creating new knowledge or community service.
- Case-based small-group discussion and problem-oriented learning in both electives and most of the required courses stimulate active learning by students.
- The curriculum addresses conveying bad news to patients and families and other difficult doctor–patient communication issues with the use of simulated situations. These exercises are part of the required fourth-year primary care experience and are done in small groups. Each student is presented with a clinical scenario, a nurse practitioner and a faculty member simulate a patient and/or the family, and the student presents the information to the patient and/or family. Colleagues in the small group and the faculty then critique each student's efforts. Students have rated this experience as one of the highlights of this clerkship.

Application of Computer Technology

- The Vanderbilt University Medical Center has been a leader in the introduction of computer technology into the clinical care setting.
- Vanderbilt medical students have their clinical experiences in an environment that provides exposure to and experience with cutting-edge technology for record keeping, ordering, decision making, and on-demand access to on-line literature references.
- Multimedia technology is used in support of teaching both in the classroom and for study and assessment.
- E-mail is provided for all students and faculty and serves to promote communication.
- Vanderbilt has been an active participant in the AAMC Curriculum Management and Information Tool (CurrMIT) project and uses the curriculum database to facilitate information exchange about curricular content among teaching faculty.
- Students in primary care clerkships are now participating in a study of the effectiveness of Web-based asynchronous learning in lieu of gathering for lectures so that disruption to their experiences with patients and clinician mentors can be minimized.

Clinical Experiences

- The required clinical curriculum provides students with a balanced exposure to inpatient and ambulatory care.
- Inpatient experiences are varied and occur in an academic medical center, private hospitals, and a Veterans Administration hospital.
- Ambulatory clinical experiences have been part of the required curriculum for several years. There are required four-week rotations in emergency medicine and primary care medicine.
- Students spend time in physicians' offices during the pediatric core clerkship as well as during the four-week fourth-year primary care clerkship.
- Students have the option of working in a pediatrics or adult general medicine environment to complete the required primary care rotation. Some students may opt to complete this rotation at sites distant from Nashville.
- Students have had options for clinical exposure during the preclinical years in preceptorships with community physicians and in the hospital and community emergency medicine system through the elective program.
- The elective preceptorship will be incorporated into the required curriculum of the first two years so that all students will now have this experience as part of a program that focuses on the doctor–patient relationship and the social context in which medicine is practiced.

Curriculum Review Process

- A major curriculum review was accomplished at an all-day retreat of faculty and students, with subsequent workshops by specific task forces and activities of the Academic Programs Committee. The outcome of this review process was the development of specific learning objectives for the curriculum that could be used as benchmarks for curricular development and assessment. Themes derived from the review process included:

- improved coordination of content across the curriculum. This has been addressed with the use of the AAMC CurrMIT system to provide teaching faculty with access to information about the contents of other parts of the curriculum with which their own teaching activities might be linked.
- Increased attention to cultural sensitivity and ethical, social, legal, and economic issues as they relate to the doctor–patient relationship and the context in which medicine is practiced.
- Affirmation of the value of the elective component of the preclinical curriculum as a means for students to pursue areas of special interest and to individualize their educational experiences:
- This commitment to the elective program and its values has led to increased efforts from faculty to support student-initiated elective experiences. Active learning by Vanderbilt students and their involvement in the assessment and evolution of the curriculum have contributed importantly to Vanderbilt's having the highest rating of graduates' satisfaction with their educational experiences.
- Attention is paid to "professionalism" and those aspects of the curriculum and educational environment that support the development of desired characteristics of a physician.

  The faculty is developing specific learning objectives for the longitudinal component curriculum that will address professionalism.
- Achievement of many of the defined learning objectives is reached in steps and matures with time, and some of these objectives, particularly those that are attitudinal and behavioral, cannot now be readily assessed.

◆ The assessment of students in the clinical years has been modified so that students must not only pass each of the required clerkships, but also demonstrate during the course of the third year satisfactory progress in achieving six categories of learning objectives: knowledge, accessing information, skills for diagnosis and management of patient problems, clinical reasoning, communication skills and interpersonal relationships, and professionalism and values. This longitudinal approach to evaluation not only tracks the smaller number of students with difficulties but also, most significantly, provides students with formative evaluations to assist them in their development as physicians.

Baylor College of Medicine

REBECCA KIRKLAND, MD, AND BOYD RICHARDS, PHD

Curriculum Management and Governance Structure

- Dramatic shifts in size, membership, and role of the curriculum committee have occurred since curricular renewal was initiated.
- The committee size was reduced from 44 members to 13; members were appointed based on their educational leadership, not department membership.
- Student membership on the committee increased from two to three.
- A position of curriculum dean was created and the chair of the curriculum committee was appointed to that position.
- Course directors' accountability to the curriculum committee has been increased.
- Standardized course and faculty evaluations are under the direction of the curriculum dean.
- The curriculum dean reports to the academic deans and the vice presidents.
- A member of the curriculum committee has been appointed chair, replacing the curriculum dean as chair.
- New subcommittees of the curriculum committee have been formed to stimulate ongoing renewal.

Office of Education

- The school created an Office of Curriculum in 1995 with four staff members to support the medical school curriculum.
- A director, with a faculty appointment, was hired in 1996, and additional staff were added during the next three years.
- In 1997, the Office of Educational Assessment and Research was created, with one faculty and two staff.
- These two offices work in tandem to provide curriculum coordination for non-departmental courses, to evaluate all courses, and to provide a variety of educational services to the College.

Budget to Support Educational Programs

- In 1995, when the Office of Curriculum was formed and a revised curriculum was implemented, the school established a discrete budget to support specific, non-departmental components of the curriculum.
- Funds for this discrete budget come from monies received from the state of Texas and from other general operating budgets of the college.
- This budget includes salaries for members of the Office of Curriculum and the Office of Educational Assessment and Research and monies for curriculum supplies or contract services and travel for faculty to national meetings or conferences.
- This is not a comprehensive budget and supports only a small part of the educational program.
- Other monies for education are distributed directly to departments as part of long-established budgeting procedures.

Valuing Teaching

- As part of the curriculum renewal process, faculty indicated the school needed to provide a system of instructor recognition and reward for excellence in teaching.
- The Master Teacher's Fellowship Program was created to address this request.
- The Faculty Training and Education Committee was formed and evolved to become the Committee for Educator Development with the purpose of creating a proteaching environment at the school.
- The committee provides workshops to improve teaching skills and to orient faculty to teaching opportunities. It has developed programs to reward excellence in teaching and contributions in education.
- Funding has been identified for the Barbara and Corbin J. Robertson, Jr. Presidential Teaching Award.
- A Web site was developed to permit easy access to information about the teaching opportunities.
- A medical education seminar series was created to highlight scholars in medical education.
- A system of measuring teaching quality, including student and resident evaluation of teaching quality of lecturers and clinical attendings, was developed and implemented.
- Faculty continue to express dissatisfaction that department chairs do not recognize the importance of their teaching contributions and that there are increasing

pressures to spend more time in revenue-producing activities.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school adopted an educational goals statement in 1991.
- When the new curriculum committee met in October 1992, a mission statement and basic tenets were articulated and agreed upon.
- In 1993, the committee crafted the statement of ultimate outcomes: To prepare skillful, productive, ethical physicians who advance and apply, in a humane fashion, scientific discovery and technologic innovation to the health care needs of individual patients, their families, and to larger societal groups.
- The outcome statement was revised in 2000 to include explicit references to professionalism. A list of the specific recommendations and outcomes identified by the committee is available from the authors.

Changes in Pedagogy

- There has been a reduction in lecture hours.
- Clinically oriented longitudinal courses have been added to the preclinical curriculum.
- Pathophysiology, pathology, and pharmacology are organized into organ-based modules.
- An "academic half-day" has been added to the clinical curriculum for longitudinal courses.
- Further integration of the basic science disciplines is planned.
- There are plans for the systematic insertion throughout the four-year curriculum of learning experiences and performance assessments related to priority thematic areas (e.g., women's health, pain management, palliative care, managed care, evidence-based medicine, genetics).
- Nutrition, evidence-based medicine, critical appraisal, radiology, and ethics have all been added as required courses.
- Required ambulatory experiences have increased to 10% of the time in the first 18 months of the curriculum and an additional 10% in the third year. Clinical core rotations have increased ambulatory experiences as much as 30% (e.g., in surgery).
- A number of courses using small groups and cases were introduced as part of the curricular revision process. These courses include Integrated Problem Solving (IPS), which uses methods of problem-based learning; Patient, Physician and Society (PPS), which involves biweekly small-group skill-development sessions; and Mechanisms and Management of Disease (MMD), which involves weekly student-led case discussions.
- Standardized patients are used in the Family and Community Medicine clerkship and throughout the PPS course for teaching and assessment.

Application of Computer Technology

- Students are not currently required to own computers, although many do.
- The school has a computer lab and a number of classrooms are networked for individual or group use.
- Preclinical-curriculum students use these computers for accessing e-mail, viewing images and slides from labs or lectures organized on the Web, and reviewing streaming video files of lectures.
- First-year students complete an informatics module within the first two weeks of school, ensuring that they have basic computer and information-management skills.
- Auditoriums have LCD projectors and hookups for laptop computers to display Power Point slides, simulations, animations, and other multimedia materials.
- A task force is addressing and prioritizing information technology issues in education, including hand-held computing devices, use of simulation, the balance of didactic lecture- and information-technology–based cases, course information on the Web, and Web-based technology for the evaluation process.

Changes in Assessment

- Standardized patients are used in an OSCE at the end of the PPS course and in an end-of-clerkship assessment in the Family and Community Medicine clerkship.
- "Passports" have been introduced in community-oriented longitudinal courses.
- Using passports, preceptors document adequate student performances of specified skills (e.g., mini–mental-status exam).

Clinical Experiences

- Students begin their required clinical clerkships midway through their second year. Most of these clerkships are based in one or more hospitals in the Texas Medical Center, the largest medical center in the world.
- Students also complete a number of elective clinical rotations.
- First-year students work in clinical offices of community preceptors one afternoon approximately every other week.
- For the first six months of the year, second-year students work with faculty preceptors one afternoon every other week in an inpatient setting.
- In addition to their clerkships and electives, third-year students work in a community preceptor's office one afternoon every week for six months and then rotate one afternoon a week through community health service agencies for the other six months.

Curriculum Review Process

- The curriculum was reviewed four times in the decade prior to the initiation of curricular renewal:
  - February 1985—medical education task force
  - June 1990—curriculum self-study
  - 1990–91—medical education 2001 task force
  - April 1992—medical education 2001 task force executive faculty retreat
- Foremost among the task force's recommendations was the need to redesign and empower the curriculum committee.
- Important strategies used in the curricular review and ultimate curricular renewal included:
  - agreement on basic tenets or principles
  - leadership by the dean(s)
  - communication with the faculty and "buy-in"
  - external stimuli used to indicated urgency and to engender the desire and will to change
- The curriculum is evaluated using student feedback from student-initiated focus groups for each course; administration-led focus groups for each curriculum block; end-of-course written surveys, and student representation on the curriculum committee.
- Faculty provide feedback about the curriculum through curriculum and course committee meetings, periodic written surveys, and longitudinal structured interviews with selected faculty.
- The outcomes of the program are evaluated using students' performances on written exams (NBME basic science comprehensive exam, course exams, USMLE).
- Three task forces have been appointed to evaluate the next steps in curricular renewal.

University of Texas Southwestern Medical Center at Dallas Southwestern Medical School

JENNIFER CUTHBERT, MD

Curriculum Management and Governance Structure

- In 1997 the office of the associate dean of medical education was split into two offices: the offices of the associate dean of undergraduate medical education and the associate dean of graduate medical education.
- Curriculum management is the responsibility of the
  - dean
  - associate dean of undergraduate medical education
  - curriculum committee
  - office of medical education
  - course directors

Office of Medical Education

- The Office of Medical Education was established in 1990 and grew out of the former office of Instructional Development and Evaluation Services of the Biomedical Communications Resource Service Center, established in 1972.
- The Office of Medical Education is involved in course and faculty evaluation and faculty development.
- The responsibilities of the Office of Medical Education have been expanded to include tutoring, recruitment training, and utilization of standardized patients for teaching and evaluation (OSCE); direct support of computer-assisted learning; case-based learning; and attending to students with special needs.

Budget to Support Educational Programs

- During the annual budget process, monies are allocated to various departments that support educational programs.
- The budget is funded by state funds and grants.

Valuing Teaching

- Students vote for faculty to receive awards presented for best lecturer.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Each course director and related faculty determine their own course requirements.

Changes in Pedagogy

- Small-group experiences have been an integral part of a number of first- and second-year courses for many years, but the process is evolving.
- Psychiatry, clinical ethics in medicine, clinical medicine, pathology, anatomy, cell biology, medical microbiology, and integrative human biology all use small-group learning.
- Clinical medicine and pathology, both second-year courses, use case-based teaching, and other courses are beginning to use this technique
- Standardized patients are used in the first-year course clinical ethics in medicine course and in the second-year course clinical medicine.
- Standardized patients are used in the OSCE.
- In the second year, both clinical medicine and pathology use case-based teaching, and other courses are moving in that direction.
- The first-year clinical ethics in medicine course and the second-year clinical medicine course use standardized patients for both teaching and assessment. Standardized patients are also used in the OSCE.

Application of Computer Technology

- Students are required to have computers of their own, in addition to computers provided by the school.
- During the past two years, staff have been hired or reassigned to help with curriculum development, especially electronic curriculum development.
- In 1994, computers were purchased for first- and second-

year students; these computers have been upgraded recently.

- The psychiatry course used the computers to provide a massive bank of exam questions for student self-study.
- The pathology course discarded a lecture-based course and developed a case-based one using gross and microscopic images with overlays that students could access on the computers.
- The clinical medicine course integrates computer presentation of case histories, laboratory tests, radiographs, EKGs, etc., with small-group presentations.
- Virtually all courses have now developed some element of computer-based study, and several master documents, such as schedules and exam banks, are available.
- Students, faculty, and staff also use e-mail for communication. Efforts have been made to focus on using the strengths of the computer for teaching.

Changes in Assessment

- Standardized patients are used, with recruitment, training, and utilization coordinated through the Office of Medical Education.
- Computers are used for self-assessment in the preclinical years.
- Faculty observation of lectures presented in the individual courses is used.
- Students must pass an OSCE in the clinical medicine course.

Clinical Experiences

- Students have opportunities in physicians' offices during several rotations and clerkships (psychiatry, family medicine, pediatrics, and women's health), most particularly the family medicine rotation.
- Both third- and fourth-year medical students are involved in hospital wards and subspecialty and ambulatory clinics.

Curriculum Review Process

- A major review of the entire curriculum was begun in September 1997.
- The goals of this curricula renewal effort were to examine each course and to make recommendations regarding the length of time allotted for teaching, the placement of individual courses in the schedule, and the exact content that was being taught.
- Each course director made an individual presentation to the committee, and the committee members made their decisions after considering all the courses throughout the curriculum.
- Recent efforts have focused on improving vertical and horizontal integration of the curriculum and on increasing the utilization of innovative, educationally sound computer-assisted learning.
- There have been substantial challenges and unanticipated outcomes in the technical issues, to be addressed as part of increasing computer-assisted learning.
- The changes are being evaluated prospectively by each course that has instituted modifications in its learning and teaching process.
    - At the individual level, each course has an evaluation of the faculty and the course that is initiated by the course director at the end of the course. First- and second-year courses are also evaluated at the end of the academic year. Third-year clerkships are evaluated at the end of the academic year. Fourth-year selective/electives are evaluated at the end of each selective/elective. All evaluations with comments are given to the course or clerkship director.
- At the institutional level, the Basic Science Education Committee and the Clinical Science Education Committee are components of the Six-Year Strategic Plan.

Future Goals

- At the individual level the goal is to strive to increase the return rate of all evaluations. At the institutional level the following goals have been identified:
    - Clinical science
        - —Priorities are to incorporate technology into the teaching program wherever and whenever possible
        - —Integrate all four years of the curriculum
        - —Develop an honors program to acknowledge excellence in research as well as coursework and community and university service
        - —Develop an institutional PhD program to be undertaken during postgraduate training or after clinical training.
        - —Develop institutional core GME programs in the business of medicine, ethics of medicine and research, compliance, risk management, and quality improvement
        - —Acknowledge teaching with rewards and awards, with increased visibility of rewards for excellence in teaching

- Basic science
  - —The recruitment of faculty to enhance teaching and training in research in the areas of human genetics, neuroscience, chemical biology, immunology, developmental biology, microbiology, and cell biology must remain a high priority.
  - —The goals and objectives of the basic science curriculum of the medical school must continually be reviewed and appropriate changes made in its content, organization and management.
  - —The staff of the Curriculum Design and Development Group must be recruited, and the central office housing this group must be established. The systematic evaluation of each course must begin, and the staff of the curriculum design group, together with the course directors, must begin entering and testing lectures and illustrative material into an electronic format. A bank of interactive test questions must be developed, and links between lectures in the different basic science courses and lectures during the clinical years must be developed.
  - —Expansion and enhancement of the institution's basic science graduate programs must occur apace with expansion of the research-active faculty. Increased emphasis must be placed on recruitment of the brightest research-oriented students into these programs and to the establishment of additional sources of funds for student stipends.
  - —The Medical Scientist Training Program should be sustained at its current level of enrollment. Vigorous recruitment efforts should continue in order to enhance the pool of outstanding applicants to this program.
  - —The institution must maintain the attractiveness of faculty positions in terms of salary level, fringe benefits, and start-up funds for new faculty, salary levels for technical and clerical staff, and access to critical institutional core facilities. Maintenance of a mechanism for interim funding for faculty who suffer temporary losses of competitively-won grant support should be an institutional priority.

University of Texas Medical Branch at Galveston

ANDREW F. PAYER, PHD, MARTHA G. CAMP, PHD, MICHAEL A. AINSWORTH, MD, AND WALTER J. MEYER III, MD

Curriculum Management and Governance Structure (See Figure 1)

- Since 1990, the curriculum has evolved from a highly traditional lecture-based program to two parallel curriculum tracks for years one and two:
  - the Interactive Learning Track for 24 of 200 students/year—a problem-based curriculum (1995)
  - the Integrated Medical Curriculum for 176 of 200 students/year—a hybrid of problem-based and traditional educational methods (1998)
- Governance of the two tracks is through the Curriculum Committee, composed of eight members elected by faculty and eight members appointed by the dean. This represents a centralized approach to curriculum management.
- Coordinating committees for both the Interactive Learning Track and Integrated Medical Curriculum assist the Curriculum Committee.

Office of Education

- The Office of Educational Development (OED) was established in 1971 to assist faculty in their roles as teachers, course and curriculum designers, and evaluators.
- OED staff guide curriculum evaluation, foster education innovation, conduct educational research, and provide faculty development.
- Funding for the OED is provided through state funds and supplemented by external grants; special state-funded grants have supported some activities.
- During the decade of the 1990s the responsibilities of the OED have grown and changed to include involvement in:
  - planning the Interactive Learning Track
  - encouraging students to select generalist careers
  - planning and administering the Integrated Medical Curriculum
  - initiating and sponsoring a faculty development program, Scholars in Education
  - managing the Standardized Patient Program, established in 1974
  - training faculty as facilitators for small-group, problem-based experiences

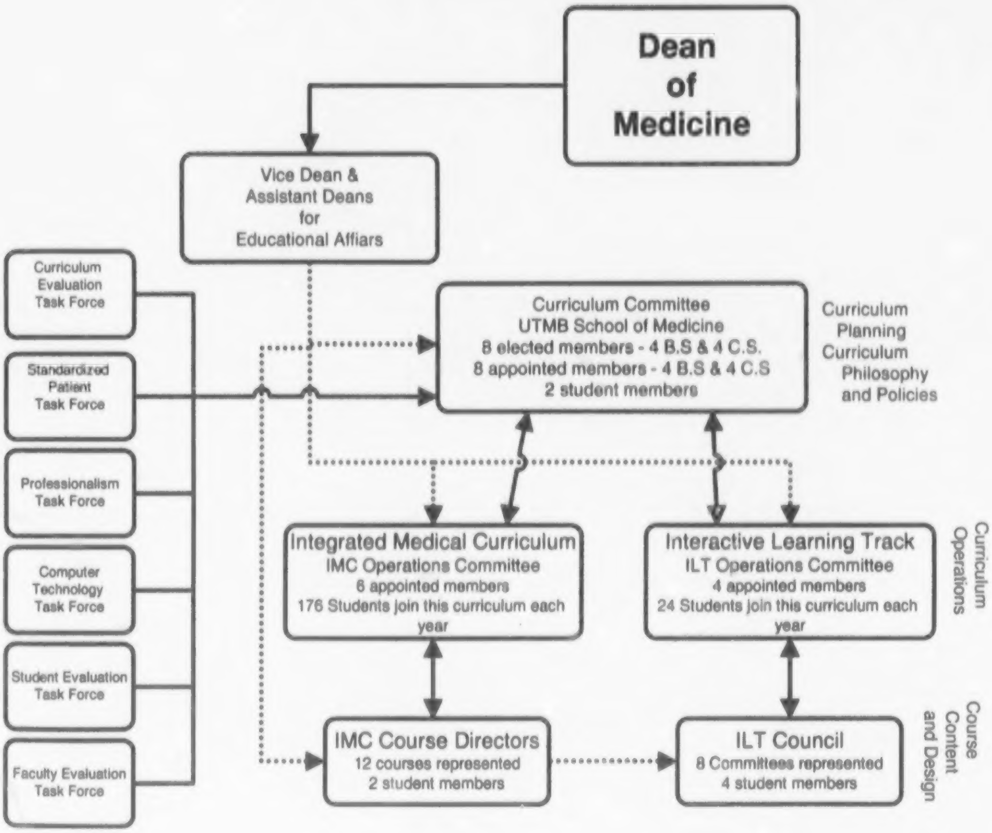
Budget to Support Educational Programs

- Centralized educational effort is located in the Office of the Dean; the primary source of support is state funding.
- The centralized budget is managed by the Vice Dean and is divided into four sections:
  - Integrated Medical Curriculum
  - Interactive Learning Track
  - Office of Educational Development
  - Primary Care Education
- Some designated clinical dollars are used for special sections of the budget (e.g., standardized patients).
- Most of the clerkship courses do not have identifiable budgets, but their support is part of the respective clinical departmental budget.
- Robert Wood Johnson primary care initiative grant enabled more clinical experiences in years one and two.

Valuing Teaching

- Amounts of faculty contact time in lectures, small-group experiences, laboratories, and committees related to the curricula are being documented for each faculty member.
- Each department in the medical school is expected to provide a proportionate number of 50-hour faculty slots per year to the educational program of years one and two. This "quota" involves approximately half of the School of Medicine.
- Current recognition for excellence in faculty participation is determined by a variety of student, alumni, and administration awards that range from a certificate to monetary reward.
- A subcommittee of the curriculum committee—the Faculty Rewards Committee—is currently developing improved ways to document the quality and quantity of educational efforts of faculty and suggesting rewards for such efforts.
- The institution is currently part of the national effort to

FIGURE 1: Curriculum Administration


Dean of Medicine
Vice Dean & Assistant Deans for Educational Affiars
Curriculum Evaluation Task Force
Standardized Patient Task Force
Professionalism Task Force
Computer Technology Task Force
Student Evaluation Task Force
Faculty Evaluation Task Force
Curriculum Committee
UTMB School of Medicine
8 elected members - 4 B.S & 4 C.S.
8 appointed members - 4 B.S & 4 C.S
2 student members
Curriculum Planning
Curriculum Philosophy and Policies
Integrated Medical Curriculum
IMC Operations Committee
6 appointed members
176 Students join this curriculum each year
Interactive Learning Track
ILT Operations Committee
4 appointed members
24 Students join this curriculum each year
Curriculum Operations
IMC Course Directors
12 courses represented
2 student members
ILT Council
8 Committees represented
4 student members
Course Content and Design

explore mission-based management of funds, which would include documenting and funding educational efforts of faculty and their respective departments.

- Faculty will be evaluated on their handling of different teaching modalities, including lecture, small-group facilitation, laboratory instruction, clinical precepting, and the teaching of procedures. Evaluation of the development of special materials and learning tools will also be done. The course directors will provide summaries of the faculty teaching evaluations to the chairs of the departments in which the faculty hold primary appointments.
- Faculty are encouraged to develop and add to teaching portfolios that include documentation of their efforts along with evaluations.
- The best teachers are identified by their performances, not the numbers of hours spent or the numbers of courses taught.
- Task forces consisting of students and faculty who review the portfolios and select the best one to three teachers in each course make awards for high-quality teaching.
- Appointment, Promotion and Tenure Committee reviews educational portfolio of faculty.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- A faculty committee appointed by the dean, including members of the Curriculum Committee, met to specify curriculum goals students would be expected to achieve before graduation.
- In addition to goals defined by committees, the MSOP objectives were reviewed.
- The Curriculum Committee recommended that the MSOP objectives, with some modifications, be accepted as the goals of the Integrated Medical Curriculum. This

recommendation was adopted. [This list of goals is available from the author.]

Changes in Pedagogy

- Small-group learning is a more integral part of the curriculum.
- Beginning in 1998, all year one and year two courses have incorporated small-group, case-based learning for a significant part of the instruction.
- All courses are expected to have a minimum of 50% of time spent in problem-solving sessions such as labs and small-group tutorials.
- All tutorials are based on clinical cases that relate directly to the basic science content emphasized in the respective courses.
- Standardized patients (SPs) are used throughout the four-year curriculum.
- State legislature mandated for a four-week family medicine clerkship.

Application of Computer Technology

- Students have not been required to purchase computers, but that is likely to change in the next year. Interested students may purchase or lease PCs on campus as part of a campus-wide "technology refresh" program. Recommendations for minimum PC standards are provided for students who already own computers or who wish to purchase them independently.
- There currently is ample access to digital resources via computers in the small-group rooms, library computer center, and student center.

Computers are integrated into the two University of Texas Medical Branch curricula and serve a variety of functions:

- Each of the 48 small-group rooms has a computer connected to the institutional network.
- The graphic images (microscopic and radiographic images, patient photos and videos) incorporated into problem-based cases are available from a server to computers with large monitors in each of the small-group rooms where problem-based learning sessions are held.
- Courses use a variety of locally developed and acquired programs and atlases as supplemental or required aspects of the instructional program. Courses that heavily utilize this technology include the anatomy/radiology course, the endocrinology/reproduction course, the obstetrics–gynecology clerkship, and the multidisciplinary ambulatory clerkship.
- The Interactive Learning Track utilizes a series of clinical computerized cases (diagnostic reasoning cases) for both small-group experiences and assessment of clinical reasoning.
- Courses/clerkships administer low-stakes tests on computer using the LXR Interactive testing program.
- Each course has its own Web page that displays logistic information, including schedules, policies, procedures, and faculty contact information. The Web CT program is used to provide uniform organization, layout, and navigation for the Web site of each course.
- Students use notebook computers for off-campus clerkships in year three.
- End-of-course evaluations by students are administered on-line for all courses.
- Students are provided free e-mail accounts, which can be accessed on or off campus.
- Students on community-based rotations such as the multidisciplinary ambulatory clerkship and the family medicine clerkship are provided laptop computers for communication and instructional purposes.

Changes in Assessment

- Summative assessment exercises using SPs are part of student assessment.
- Year three clerkships (internal medicine, family medicine, multidisciplinary ambulatory clerkship) use SPs as part of summative objective structured examinations.
- A year-four SP-based clinical skills examination must be passed for graduation.
- OSCEs and faculty observation of clinical skills have been used for many years.
- Both tracks are now assessing student performances in small-group tutorial experiences.
- Grading has changed from letters and numbers to final course grades of Honors, High Pass, Pass, or Fail.
- Class ranking is no longer reported.

Clinical Experiences

- Students have monthly clinical experiences within 50 miles of campus in community physicians' offices as part of a longitudinal, community-based, primary care experience in years one and two.
- Every year-three student has a 12-week community-based ambulatory clerkship somewhere in Texas.

- Year-three rotations include inpatient, outpatient community, and mixed clinic/inpatient assignments.
- Students can elect to take off-campus clinical preceptorships during break periods or during fourth-year electives.

Curriculum Review Process

- In the spring of 1996 a curriculum task force consisting of over 90 faculty, students, and staff was appointed.
- Subgroups of the task force were assigned to deal with
  - unmet needs of the curriculum
  - rewards for teaching
  - modalities of education
  - the basic science core
  - organ systems
  - primary care education
  - specialty care
  - evaluation and assessment
- These subgroups were charged with looking at the (then) current curriculum and making recommendations for curricular changes.
- It was recognized at that time that faculty participation in teaching should be documented, compensated, and recognized. Discussions were focused on both the philosophical and structural issues of a medical curriculum for the future.
- The results of this operation identified the current realities of the educational program and an action plan that led to a template of the structure of the curriculum, needs for faculty in this type of curriculum, and suggestions for monitoring and evaluating the curriculum.
- This action plan was presented to and approved by the faculty of medicine. Course committees and chairs were identified and charged to develop the new courses. A new curriculum committee was organized to oversee the new curriculum, now called the Integrated Medical Curriculum.
- In 1999, the faculty of medicine were given a progress report on the previous four years of the problem-based Interactive Learning Track. They voted to continue this program as a separate track for the next three years.
- Another analysis will be done after that period and a decision made about whether to continue this program as a separate track.
- Through a Curriculum Committee Subcommittee for curriculum evaluation, a formal, centralized curriculum-evaluation process allows monitoring of curricular performance against curricular goals as well as identification of areas requiring attention for the Integrated Medical Curriculum and the Interactive Learning Track.
- The process provides for regular, periodic evaluations of curricular components and contributes to a database for longitudinal study of curricular outcomes, including student ratings of important curricular elements collected after each course, and student focus groups.
- Faculty surveys explore specific issues. The resulting data are reported to course directors and to the Curriculum Committee for use in its formal course review process.
- Additional elements of the curricular evaluation process, including surveys of graduates and their residency program directors, are planned for the near future. The Curriculum Committee makes changes or adjustments in the curriculum based on this information.
- The AAMC Curriculum Database CurrMIT is currently used to catalogue and review the content of years one and two in the medical curriculum.

Future Goals

- Faculty development in the area of teaching and learning, e.g., the faculty role in small-group learning
- Improvement of the skills of faculty to provide subjective evaluations of students in small-group tutorials and clinical assessments
- Increased use of educational technologies, including the use of computers and Web-based resources
- Enhancement of faculty commitment to and understanding of a student-based curriculum
- Improving the transition of students from faculty-centered undergraduate curricula to a student-centered medical curriculum
- Development of assessment strategies that provide valid evaluations of student progress toward curricular goals

University of Texas—Houston Medical School

Patricia M. Butler, MD, and Linda C. Perkowski, PhD

Curriculum Management and Governance Structure

- ◆ Management of the educational program is under the purview of the medical school Curriculum Committee—a standing committee of the Faculty Senate.
- ◆ The Curriculum Committee is composed of faculty representatives, administrators, and representatives from the Office of Educational Programs.
- ◆ The Curriculum Committee is chaired by a member of the general faculty.
- ◆ The Office of Educational Programs works cooperatively with the Curriculum Committee in the development, implementation, and evaluation of all curricular offerings.
- ◆ The associate dean for educational programs, who is responsible also for graduate medical education, reports directly to the dean of the medical school.
- ◆ Three part-time assistant deans support student activities and various educational activities associated with both undergraduate and graduate medical education.
- ◆ The governance structure and management of the educational program have not changed since 1990.

Office of Education

- ◆ The Office of Educational Programs (OEP) supports the educational programs, the faculty, and the administration.
- ◆ The OEP was developed in 1987 with the appointment of an associate dean for educational programs. The first medical educator was appointed to the OEP in 1994.
- ◆ The director of the OEP is a full-time (PhD) medical educator.
- ◆ An assistant dean (50% time) was appointed in 1990, with responsibility for student support activities.
- ◆ The OEP is supported currently by three medical educators, one of whom is the director; in addition, there are a coordinator for the standardized patients and skills programs and three full-time secretaries.

Budget to Support Educational Programs

- ◆ There is a discrete budget identified to support the educational programs, established by the dean.
- ◆ Support for the OEP is primarily from the state; some funding is derived from grants.
- ◆ The OEP has considerable grant funding to support the development of technology in education.

Valuing Teaching

- ◆ Faculty whose primary responsibility is in medical student education are identified by the chairs of their respective departments and their contributions are documented in their "faculty profiles."
- ◆ The Dean's Teaching Excellence Awards recognize faculty for their contributions to education.
- ◆ Students may recognize faculty for outstanding teaching.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- ◆ Faculty have identified and agreed upon learning outcomes that students must demonstrate prior to graduation.
- ◆ These outcomes include
    - performances in basic science courses as measured by written examination
    - performances on clinical clerkships as measured by written examinations and faculty ratings
    - scores on USMLE Step 1 and Step 2
    - performances on OSCE and CPX

Changes in Pedagogy

- ◆ Problem-based learning (PBL) was introduced into the second-year curriculum in 1994.
- ◆ Lecture hours were reduced substantially, and PBL small groups were instituted for all students three times per week for the entire second year.
- ◆ Paper clinical cases are used to teach basic science material in a clinical context.

- Standardized patients are used for instruction in interviewing skills and physical examination skills, assessment of history/physical examination in years one and two, and assessment of patient examination/diagnosis/assessment skills in the fourth year.

Application of Computer Technology

- Since 1995 all entering students have been required to own computers. The Computer Advisory Committee outlines the specifications.
- Computer-assisted instruction is an integral part of several basic science courses.
- It is anticipated that computers will be used in clinical clerkships, including ambulatory care sites.
- Students on clerkships are now using computer-based entries for tracking patients.

Changes in Assessment

- Standardized patients were first used for assessment of students in 1992. The standardized patient program has continued to evolve and is now a formalized program used in both instruction and assessment of students.
- Computers are not used currently in assessment but are under consideration (i.e., case-based protocols assessing basic science knowledge).
- Faculty observation is considered a very important component in the assessment of students. Faculty are involved in all standardized-patient–based examinations.
- Use of performance-based examinations has increased over the last eight years.
- OSCEs are utilized in first- and second-year clinical skills courses.
- Students take a clinical practice examination in the fourth year.

Clinical Experiences

- Clinical education occurs in three kinds of sites, beginning in the first year:
  - inpatient wards
  - outpatient clinics
  - physicians' offices

Curriculum Review Process

- The medical school curriculum is continuously under review by the Curriculum Committee.
- Themes and goals for curricular renewal include:
  - increased ambulatory care clinical experiences
  - implementation of a longitudinal continuity care experience throughout the third year
  - emphasis on the basic mechanisms of disease during the clinical years
  - emphasis on the use of technology for education and patient care during the clinical years
  - emphasis on prevention, health promotion, evidence-based medicine, and ethics in the clinical years
  - use of a comprehensive assessment to provide feedback to students about their performances and indicate areas for remediation
  - increased flexibility of student scheduling during the clinical years
- Process under way:
  - A third- and fourth-year subcommittee of the curriculum has been established, chaired by an assistant dean for educational programs.
- Planning resources needed:
  - Faculty time
  - Administrative support
  - Technical support
- Implementation resources needed:
  - Support from the dean
  - Identification of additional community preceptors
  - Administrative support
  - Faculty time
  - Community faculty development
  - Technical support
  - Support from chairs and clerkship directors
  - Support from basic science faculty
- Strategies used:
  - Questionnaire to faculty, residents, and students to assess strengths and weaknesses of the clinical curriculum
  - Strong support from the dean
  - Support from the Office of Educational Programs
  - Involvement of basic science faculty
  - Student involvement in review process
  - Identification of clinical competencies for all graduates
- Challenges to the process:
  - Resistance to change
  - Faculty time needed to develop the curriculum
  - Fear of loss of clerkship time by departments
- Plans for evaluation:
  - Program evaluation by students (questionnaires and focus groups)

- Program evaluation by faculty/community preceptors (surveys)
- Analysis of student performances on USMLE Step 2
- Assessment of student performances on fourth-year clinical practice examination (faculty observations and standardized patients' checklists)
- Examination of AAMC Graduation Questionnaire data (review of areas perceived as deficient)
- Assessment of graduates' performances during residency (questionnaire to program directors)

University of Texas Medical School at San Antonio

NANETTE CLARE, MD

Curriculum Management and Governance Structure

- ♦ The curriculum committee of the medical school has overall responsibility for curriculum planning and evaluation.
- ♦ The associate dean of academic affairs serves as the director of curriculum, with responsibility for oversight, guidance, and implementation of changes.
- ♦ The Office of the Associate Dean of Academic Affairs is now the central coordinator of the new second-year integrated system.

Office of Education

- ♦ The Office of Educational Research and Development serves the entire Health Science Center and has given valuable assistance in the planning and transitioning of the new curriculum.

Budget to Support Educational Programs

- ♦ Funding for the new curriculum is provided by the dean's office.

CURRICULUM RENEWAL PROCESS

- ♦ For the past 25 years, the overall curriculum has been based on a traditional plan of two years of basic science instruction followed by two years of clinical training. The instruction has been departmentally based with little integration or coordination between courses and clerkships.
- ♦ In 1996, the dean convened a task force through the curriculum committee to develop a new curriculum for the first two years of medical school. The final plan was accepted in 1997 for implementation with the new first year with the class entering in 1998 and implementation of the new second year with the same class in 1999. Currently, the curriculum committee is working on plans for the third and fourth years.

Changes in Pedagogy

- ♦ First year: A major change was to add the Clinical Integration Course (CIC).
    - The first part of CIC is the only course in first month of medical school; students learn basics of patient interaction, obtaining patient histories, performing physical examinations.
    - Much of the instruction is in small-group sessions with standardized patients.
    - The second part of CIC extends throughout the first year; students rotate one half-day a week on each of the following:
      —having standardized patient encounters
      —shadowing a third-year medical student
      —studying community medicine with a preceptor
      —reviewing case studies
      —leaving continuity of care with elders
    - Also in the first year basic science courses have been coordinated so that similar topics are covered during the same time interval.
- ♦ Second year: The curriculum is reorganized into organ-system modules with an integration of instruction from pathology, pharmacology, and clinical sciences, including internal medicine, pediatrics, obstetrics–gynecology, and surgery.
    - Efforts are made to decrease lecture hours and increase small-group instruction.
    - Clinical training continues with the advanced clinical evaluation skills (ACES) course—students learn advanced skills pertaining to the organ system with actual patients. There is also a ward experience for students to be assigned to a ward team for one week, during which the students follow a patient from admission to discharge and prepare a "shadow chart."

Application of Computer Technology

- ♦ Students are not required to have personal computers.
- ♦ Each class has a listserve used for communications between students and announcements from faculty and the administration.
- ♦ Some courses have established Web sites and/or electronic bulletin boards.

Changes in Assessment

- Students take an OSCE at the conclusion of the CIC and ACES course.

Clinical Experiences

- The curriculum committee is working on plans for the third and fourth years.
- See description of the first- and second-year clinical experience under "Changes in Pedagogy" above.

Curriculum Review Process

- The process is under way. Goals include:
  - Increase the clinical teaching in the first two years to better prepare students for the third year.
  - Integrate teaching from various disciplines for better understanding of pathophysiology.
  - Decrease lecture hours in the first two years and increase small-group teaching.
  - Integrate basic science knowledge and clinical sciences so that students understand the relevance of what they are learning.
- The curricular changes are being evaluated by
  - detailed evaluation by the curriculum committee of each course
  - individual course/module evaluations by students
  - student focus groups
  - the Medical School Learning Environment Survey (MSLES), pre- and post-new curriculum
  - student's course grades
  - USMLE Step 1 scores pre- and post-new curriculum
  - faculty evaluations of the new curriculum
  - faculty evaluations of students' clinical performances

The University of Utah School of Medicine

T. SAMUEL SHOMAKER, MD, JD, AND A. LORRIS BETZ, MD, PHD

Curriculum Management and Governance Structure

- The dean is the chief academic officer of the school.
- The curriculum steering committee is the faculty committee responsible for structuring the curriculum, administering the education budget, and evaluating educational outcomes.
- This committee is advisory to the dean of the school of medicine.
- The committee is chaired by the senior associate dean for academic affairs and includes in its membership three department chairs, the chairs of the curriculum committee for each medical school year, three medical students, and the assistant dean for student affairs and education.
- Each individual year of the curriculum is served by a curriculum committee charged with the responsibility of overseeing the courses in that year of the curriculum.
- The responsibilities of these committees include setting educational policies, evaluating courses, and reviewing student academic performances. All of these committees are composed of faculty members from both basic science and clinical departments, and medical students.
- The committees are staffed by the Office of Medical Education.
- During the period of the school's curricular reform project, which lasted from 1994 to 1999, a number of ad-hoc committees were constituted to design and implement the new curriculum. These committees worked in parallel and shared membership with the officially constituted curriculum committees.
- Upon the implementation of the new curriculum, the ad-hoc committees disbanded, leaving curriculum administration solely in the realm of the official curriculum committees.
- Membership on the curriculum steering committee and the yearly curriculum committees has changed numerous times through the 1990s. This was especially true just after the implementation of the new curriculum, when many new courses were designed and put into the curriculum.
- The course directors for the new courses were, in many cases, placed on the curriculum committees. In addition, there is a normal rotation of service on the curriculum committees that calls for members to serve terms of three years.
- The curriculum steering committee's membership was revamped to include three department chairs. This was done to stress the importance of the curricular reform, as well as to change the focus of the committee from day-to-day operations to establishing educational policy and administering the education budget.

Office of Education

- There is an office of education in the school, but its function is logistic and not professional support.
- The functions of the office are to staff the curriculum committees, to scan examinations and assist course directors in grading, to compile and disseminate course evaluations, and to amass documentation on the curriculum and its effectiveness.
- The office has been in existence for many years, but its staff has recently grown from two to four individuals to more effectively support the new curriculum.
- The dean's office also pays the salary for a half time PhD in education, who serves as the chief educational consultant for the curriculum. This individual was instrumental in helping with the design of the new curriculum, as well as assisting with the development of the curricular evaluation process.

Budget to Support Educational Programs

- An educational budget was first established in the 1996–97 academic year.
- The budget consisted of $400,000 and was derived from a 0.5% add-on to the dean's tax.
- The budget was intended to support the design of the new curriculum.
- Every year since then the curriculum has been supported by a modest educational budget.
- This year the budget amounts to $1.4 million, funded by a combination of sources: the dean's office, state funds, and tuition monies.
- The establishment of a discrete educational budget has been an important step towards enhancing the importance of education.
- The school is now engaged in a mission-based manage-

ment initiative that will establish an accurate estimate of the cost of the undergraduate educational program and support an internal reallocation of funds to ensure that adequate resources are made available for staging the curriculum.

Valuing Teaching

- The new education budget has now made specific funding available to those with major administrative and teaching responsibilities in the curriculum.
- Given the relatively meager size of the budget, it is clear that teachers are not fully compensated for their teaching efforts. The hope is that through the mission-based management initiative additional educational funds will become available so that those with significant teaching responsibilities are adequately compensated for their time in support of the educational mission.
- The promotion, retention, and tenure process has been reviewed and modified such that all faculty are required to present evidence of their teaching activities and data about teaching effectiveness.
- These data are derived from student and peer course evaluations and are made available to the various departmental and institutional committees reviewing promotion and tenure decisions.
- Candidates who have no evidence of teaching activity or who have unfavorable teaching evaluations have been rejected for promotion.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- A comprehensive set of curriculum-wide educational objectives was established in 1996 as a part of the school's major curricular reform initiative.
- These objectives were used as a blueprint for the design of the new curriculum.
- The objectives are grouped under the headings of knowledge, skills, attitudes, learning environment, assessment, teaching methods, and curriculum governance and administration.
- Each of these areas was assigned to a subcommittee for the actual work of writing the objectives.
- Each objective contains a statement of the objective, a rationale for the inclusion of that particular objective, and a method of assessing whether the objective has been accomplished.
- A group of approximately 60 faculty and medical students was involved in the writing of the objectives.
- The intention, as a part of the ongoing curricular evaluation process, is to periodically re-examine the educational objectives to ensure that they are still timely and appropriate.
- The school is interested in strengthening its ability to assess whether the educational objectives are being accomplished.

Changes in Pedagogy

- Prior to 1997 the changes were very gradual and evolutionary.
- Problem-based learning and case-based discussions were used occasionally in the first two years.
- Since the implementation of the new curriculum in 1997 there has been a marked expansion in the use of small-group teaching. However, efforts in this respect have been hampered by difficulty in recruiting sufficient numbers of faculty to serve as group preceptors.
- A number of courses in the curriculum now rely entirely upon small-group teaching, and others have significant case-based components.
- Standardized patients are extensively employed, not only for the teaching of history and physical examination skills but also as a part of two school-wide clinical competency examinations, one administered at the end of the second year of the curriculum and the other administered at the end of the third year.
- The clinical competency examinations were implemented as a part of the new curriculum in 1997.

Application of Computer Technology

- Students are not required to have computers, but computers are strongly recommended and a set of technical specifications has been published to guide students in selection of appropriate computer packages.
- Computer technology features prominently in the new curriculum and is one of six important themes that are emphasized repeatedly throughout all four years of the curriculum.
- The school has funded a faculty member with computer skills and educational interest to serve as the head of educational technology. This individual has worked closely with other faculty members to develop electronic

adjuncts to traditional teaching methods. In addition, he is charged with the responsibility of providing students with instruction in the areas of e-mail, database programs, Internet use, and slide presentation software so that all students are brought up to a minimum level of computer literacy.

- The use of Medline and other electronic technologies is called for in many courses throughout the curriculum, including the Science of Medicine course, which is designed to teach the students the principles of evidence-based medicine, and the third-year Topics in Medicine course, which calls upon students to manage simulated patient cases, using information technology as an adjunct.
- In addition to the curricular emphasis, the dean's office communicates with students solely via e-mail and also requires students to complete course evaluations on the Web.
- A modest amount of funding is available each summer for course directors to develop software and Web-based educational adjuncts using students as programmers.

Changes in Assessment

- Standardized patients are used extensively in the Art of Medicine (physical diagnosis) course to teach interviewing, history taking, and physical examination skills, as well as for student assessment.
- In addition, standardized patients are employed as a part of the school-wide clinical competency examinations administered at the end of the second and third years of the curriculum.
- The examinations are administered in an OSCE format. They are used for formative assessment of student progress and for assessment of the curriculum.
- At present the school does not utilize computer-based testing as a regular feature of the curriculum.
- Several courses have available to students both CD-ROM and Web-based electronic educational supplements that utilize self-assessment through banks of test questions. The limiting factor for the school is the lack of a computer lab with sufficient capacity to accommodate the 100 medical students in each class at any one particular time.
- Faculty observation continues to be a mainstay of clinical evaluation in the third and fourth years of the curriculum. It has also been utilized for some purposes in the first and second years of the curriculum, especially in the Art of Medicine (physical diagnosis) course.
- Students are observed doing history and physical examination activities on both standardized and real patients.
- The use of faculty observation has increased with the advent of the new curriculum.
- One especially interesting innovation has been the implementation in the medicine clerkship of the RIME method of clinical evaluation developed by Pangaro et al. This method provides for a standard vocabulary to describe clinical performance and has led to greater standardization of student evaluations and more meaningful feedback to students about their clinical performances.

Clinical Experiences

- Significant changes were made in 1997 with the implementation of the new medical school curriculum.
- Prior to 1997, the students had little or no clinical exposure in the first two years of the curriculum, with the exception of the physical diagnosis course.
- With the implementation of the new curriculum, a new course, The Patient in the Community, was started. This course places students in either community service agencies or physicians' offices one afternoon every other week for the entire first two years of medical school.
- The course is designed to convey to the students the patient's experience of the health care system, as well as to cement history-taking and physical examination skills learned in the new physical diagnosis course.
- The students also have available a popular elective experience, the student-run health care clinic for the homeless. Ordinarily about half of each class participates in this elective, which allows students to have early contact with patients in a very meaningful setting.
- The third-year curriculum contains the standard clinical clerkships, all of which now have incorporated ambulatory components.
- The fourth-year primary care preceptorship calls upon every student to serve a six-week preceptorship in a rural or underserved practice site, seeing patients and doing a community health research project.

Curriculum Review Process

- As a result of the curricular reform initiative, the school now has an extensive formal review process for curricular evaluation.
- The process has a number of components, including student course evaluations, student board scores, responses to the AAMC Graduation Questionnaire, responses to a locally developed student survey, participation with a

consortium of other schools in a curriculum survey, and student focus groups.

- Large amounts of data are compiled as a result of these evaluative activities. They are assessed at an annual curriculum retreat by the curriculum steering committee. This group mandates changes to the curriculum that seem appropriate based upon the information reviewed.
- Since this process was initiated in 1997–98, the steering committee has made a series of major adjustments in the curriculum based upon this evaluation process.
- Data from the survey instruments that are administered to students in both the new and the traditional curricula are now available and are being analyzed for trends and significant differences between the curricula. In the next year enough data should be available to produce statistically meaningful results.

The University of Vermont College of Medicine

DIANE MAGRANE, MD

Curriculum Management and Governance Structure

- Management of the educational program has moved to support continuous quality improvement and innovation in parallel with the design efforts of the faculty and students.
- The Instructional Improvement Committee, which is the standing curriculum committee of the college, works to support quality improvement by monitoring course evaluations and planning as well as by working with course directors to implement changes.
- The college has developed a system of mission-based budgeting that supports faculty effort within departments and encourages interdepartmental collaboration.
- Curricular changes are developed by task forces and interdisciplinary committees that are given well-defined charges, guidelines, and resources to address the charges, and support from the Office of Medical Education.

Office of Education

- The Office of Medical Education (OME) was established in 1994, when the associate dean for medical education position expanded from a 20% to an 80% position.
- The office now supports curricular change, innovation within courses, and faculty development in education.
- A central library and resource center, funds for innovation and travel to learn new education skills, and a formal seminar series for educators support faculty development.
- Interdisciplinary curricular development is supported by the OME. This includes support by faculty with expertise in information technology, student and program assessment, and administrative support.

Budget to Support Educational Program

- The budget for the educational program is developed by the associate dean for medical education and includes allocation from the dean of the college and grants for specific projects.
- The budget was established with the Office of Medical Education in 1994 and is reviewed annually.

Valuing Teaching

- Teaching faculty are recognized through a number of awards given by students in each class.
- The OME contributes additional funding to departments whose faculty are recognized in this way.
- Course directors whose courses receive high student ratings are acknowledged with Dean's Recognition Awards, which are associated with a modest transfer of funds to their chairs.
- Teaching evaluations are reviewed for reappointment and promotion decisions and are especially important for clinicians on non-tenure tracks.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- A database of learning outcomes has been developed after an extensive faculty consensus process to identify competencies for medical students.
- These outcomes-based learning objectives are developed within ten interdisciplinary education themes and form the basis from which instructional and assessment decisions will be made in the revised curriculum.
- The basic goals are consistent with the outcomes described by the Medical School Objectives Project.

Changes in Pedagogy

- The educational program at UVM is increasingly adopting more variety in educational methods.
- All new curricular programs are using clinical cases. This includes the new curriculum that weaves genetics, ethics, epidemiology, and public health as complementary themes through the four-year curriculum.
- Education in Family Centered Care brings students together with families of children with disabilities and is introduced with clinical cases to discuss family systems.
- Small-group learning experiences are increasing to support problem solving and collaborative learning. A pilot program in the first year introduces students in small collaborative learning groups to concepts of professional and

personal development, team building and conflict resolution, and independent learning.

- Standardized patients teach physical examination and medical interviewing skills in the first year.

Application of Computer Technology

- Computer technology is integrated into the educational program from the first day of medical school.
- Students are issued Internet addresses and receive instruction in accessing the Internet during their orientation to the medical library.
- Evaluations of the orientation experience provide their first introduction to the Internet-based course evaluation system of the college.
- The Computer Assisted Teaching System (CATS) provides Internet-based instruction for the majority of basic science courses and an increasing number of clinical courses.
- Students also have the opportunity to work in the CATS lab to develop instructional programs themselves.

Changes in Assessment

- Standardized patients contribute to formative assessment of clinical skills in the family practice, internal medicine, and pediatrics clerkships.

Clinical Experiences

- Approximately 40% of clinical clerkship education occurs in ambulatory settings, primarily in physicians' offices, many in rural practices in Vermont and Maine.
- Students in the first and second year of school have an introductory preceptorship with physicians in the community within a 45-minute radius of the medical school.

Curriculum Review Process

- In 1996, the UVM College of Medicine began to redesign its medical curriculum. This renewal, the Vermont Integrated Curriculum (VIC), is guided by a commitment to (1) integration of teaching and learning across disciplines, (2) assessment of professional competency, (3) patient and family centeredness, and (4) optimal use of information technology to enhance learning and information retrieval. It makes a shift in scientific content to address the interdependence of genetics, ethics, and epidemiology in public health.
- Interdisciplinary groups of faculty, students, and community members have worked in task forces to design new systems for faculty development and promotion, information systems, assessment systems, and overall curriculum design.
- The process is guided by the associate dean for medical education and a central steering committee.
- An annual faculty development activity, The Mud Season Educational Breakout, brings together larger numbers of the college and community to contribute to the design of new systems while learning new skills.
- Resources have come from a variety of sources, including federal and private grants, as well as redistribution of central funds.
- Funds from a newly established AHEC support rural educational systems; federal funds for telecommunication are promoting distance learning; a grant from the Josiah Macy Jr. Foundation supports development of the genetics, public health and epidemiology, and ethics programs.
- The college has made a commitment to introduce educational innovation at all levels of the curriculum and to evaluate new programs as they are introduced.
- Plans for evaluation of the change focus on
  - assessment of outcomes of student performance exams, particularly as they reflect development of educational themes
  - education productivity as reflected in the depth and breadth of programs that support the curricular change principles of integration, assessment of competency, family centeredness, and information technology, as well as an increasing number of papers and presentations about curricular innovation
  - efficiency in educational systems reflected in costs of space, faculty time, and use of resources.
- The UVM College of Medicine has been improving its systems of education, patient care, research, and administration in accordance with a strategic plan developed in 1993 and reviewed annually.
- In collaboration with the health care system, Fletcher Allen Health Care, the college is designing and building new education facilities. These facilities include a new ambulatory care center in which clinical teaching space is allocated, library and information centers for patients, faculty, and students, and a clinical assessment center.

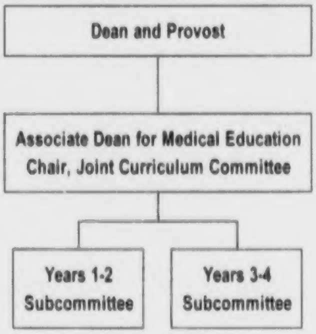
Eastern Virginia Medical School of the Medical College of Hampton Roads

CHRISTINE MATSON, MD

Curriculum Management and Governance Structure (See Figure 1)

- The dean and provost is the chief academic officer for Eastern Virginia Medical School (EVMS). He or she delegates the responsibility for the predoctoral curriculum to the associate dean for medical education, who chairs the Joint Curriculum Committee, oversees the educational programs, and directs the Office of Education.
- The joint committee is charged with assuring the relevance and appropriateness of the four-year curriculum for preparing graduates to enter postgraduate training in any discipline, and ultimately with the foundation for practice as compassionate and competent physicians responsive to the health care needs of the population.
- Two subcommittees address the details of curricular planning and management.
- The joint curriculum committee and subcommittees all include representatives from the full-time clinical and basic science faculty, the community faculty, students, and partner institutions.
- The joint curriculum committee and subcommittees are assisted by several groups that broadly involve faculty and students in curricular development and implementation and include:
  - the year-one and year-two course directors' groups and clerkship directors' group
  - the generalist subcommittee, consisting of longitudinal interdisciplinary course directors and the school's generalist scholars
  - curricular advisory groups for interdisciplinary longitudinal themes
- Since 1993, with the beginning of the school's generalist curriculum initiative, the educational focus has been increasingly interdisciplinary.
- Responsibility for implementation of the generalist programs has been in the Office of Education rather than with particular disciplines. The overall effect is increased centralization of curricular responsibility and broader faculty participation.
- The Joint Curriculum Committee, the Year 1–2 Curriculum Committee, and the Year 3–4 Curriculum Committee were appointed by the dean in 1994, replacing the single curriculum committee; and the generalist subcommittee and curriculum advisory groups were appointed by the associate dean the same year to assist with the implementation of generalist curricular innovations.

FIGURE 1: Curriculum Governance Structure


Dean and Provost
Associate Dean for Medical Education
Chair, Joint Curriculum Committee
Years 1-2
Subcommittee
Years 3-4
Subcommittee

Office of Education

- The Office of Education (OOE) was established when the school was founded in 1964.
- The OOE staff have historically supported the associate dean for education and the curriculum committees in their management of the MD program curriculum, including curriculum scheduling, evaluation of courses/clerkships and faculty, test scoring, and grade reporting.
- In early 1994, the newly appointed associate dean for education was given responsibility for implementing the generalist initiative for the predoctoral curriculum, with staff and faculty added to the OOE for this purpose.
- As a result, the responsibilities of the OOE now include
  - the establishment of interdisciplinary generalist courses in years one and two
  - identification and coordination of longitudinal four-year curricular themes
  - collaboration of the six major clerkships around generalist curricular components
  - establishment of longitudinal population-based electives in the fourth year
  - collaborative teaching and testing of clinical skills through the Theresa A. Thomas Professional Skills

Teaching and Assessment Center (standardized patient and physical teaching associate program), established in 1994

- New faculty responsible for faculty development and coordination of the longitudinal curriculum were added and new programs developed in these areas.
- A community faculty office was established, including staff and community faculty physicians, to build the early clinical experience program, including recruiting and support of community faculty to be preceptors in the three-semester Longitudinal Generalist Mentorship.
- The overall outcomes of the changes in the OOE has been greater centralization of administration of the curriculum, particularly the newer interdisciplinary components, along with leadership for greater collaboration among the disciplines.

Budget to Support Educational Programs

- A budget is allotted to the OOE to conduct its various activities. These functions include coordination of curricular scheduling, processing examination results, conducting course evaluations, providing feedback to course directors and department chairs, identifying curricular needs, and reporting on the curriculum.
- Additional discrete budgets were developed for interdisciplinary curricular projects funded by external agencies (e.g., the HRSA Interdisciplinary Generalist Curriculum Projects and Undergraduate Medical Education for the 21st Century (UME-21); the RWJF Generalist Physician Initiative with the Virginia Consortium; and the NIH-NHLBI Sleep Academic Award).
- Establishing an inclusive educational budget that would allow negotiation for protected time for teaching faculty in different departments has been considered but is currently not being pursued.
- The legislature of the Commonwealth of Virginia continues to provide to EVMS educational funds that are linked to the percentages of students entering generalist residencies and residency program graduates entering practice in Virginia. This funding provides a substantial portion of the educational budget for the OOE and EVMS departments.

Valuing Teaching

- Faculty negotiate with their chairs regarding their primary responsibilities in the medical school.
- Newly revised (but not yet approved) promotion guidelines tie evaluations for promotion to percentage of effort in each area of designated responsibility, so that teaching/education performance has more weight for those with more responsibility in this area.
- A few basic science and clinical faculty have medical student education as their primary responsibility; these are usually the course or clerkship directors.
- Each hospital in which EVMS students rotate designates someone as the site director for that clerkship; whether these responsibilities constitute their "primary responsibility" is variable.
- Predoctoral teaching faculty serve on the education committees (e.g., curriculum committees, generalist committee, medical education subcommittee of dean's Information Services Committee, and curriculum advisory groups).
- In 1994, the Generalist Scholars program was established through EVMS' generalist initiative. These six faculty, from the three primary care departments, receive recognition as faculty whose primary responsibilities are to the generalist educational program.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Planning the generalist curriculum initiative at EVMS stimulated a review of what the faculty expect all students to have accomplished in terms of knowledge, skills, and attitudes by graduation, regardless of residency choice.
- The Year 3–4 Curriculum Committee (including clinical, community, and basic science faculty, staff, and medical students) along with staff from the Office of Education reviewed the results of our 1994 survey of graduation competencies at U.S. medical schools as well as consensus statements on the knowledge, skills, and attitudes required by generalist physicians identified through literature review or professional organizations.
- The group also reviewed the learning goals and objectives from the year-three clerkships, identifying common topics. The group then harmonized the objectives from all clerkships and added the few objectives from external sources that were not being addressed in the clerkships, resulting in a list of objectives deemed necessary to require of all graduating students. [This list is available from the author.]
- Clerkship directors then collaboratively agreed on which

competencies would be addressed and evaluated within each clerkship to ensure that all objectives were covered.

- This list of "universal competencies" is now used by the fourth-year Clinical Skills Assessment (OSCE) Committee to identify appropriate patient cases to include in the OSCE required of all students at the beginning of the fourth year.

Changes in Pedagogy

- Learning in small groups in selected courses has historically been part of the EVMS curriculum in some basic science and clinical clerkships.
- Curricular changes implemented in 1994 incorporated regular weekly small-group (six to seven students) learning situations within the generalist-oriented clinical course (Introduction to the Patient—ITP) spanning the first two years.
- These small groups focus on learning clinical skills (e.g., interviewing, physical exam, motivational interviewing and patient education, decision making, medical ethics, and professional development).
- The majority of the small-group sessions include either standardized or "real" patients or physical teaching associates (laypersons trained to teach the physical exam using their own bodies as models), utilizing the inherently active aspect of learning involving live patients.
- The standardized patients are not only trained in detail in the patient-centered model of interviewing employed in the ITP course, but also trained in reinforcing other complex skills such as motivational interviewing and sharing bad news.
- Small groups are used in the three-day Life, Death and Dying course in year three, in which the "bad news" scenarios occur, and in the community-based "mock epidemic" in year two, implemented in conjunction with area public health departments.
- The year-two pathophysiology course has been and continues to be taught with a formal problem-based approach.
- Several year-one and year-two courses (e.g., anatomy, physiology, biochemistry, and micro/immunology) present case-correlation conferences to amplify their key concepts and provide the clinical contexts in which the information is applied.
- Year-one and year-two courses have also increased horizontal integration across concurrent courses.
- Standardized patients are employed in each curricular year, with the emphasis evolving from teaching in year one to assessment in year four.
- In the family medicine and internal medicine clerkships, students' history taking and physical examination of standardized patients are directly reviewed by faculty.
- In the obstetrics–gynecology clerkship, genital teaching associates review the breast, pelvic, and rectal exams with students, reinforcing these exams, which are first learned in the first year ITP course.

Application of Computer Technology

- Under the newly appointed associate dean for information technology, planning for information technology for the entire campus has been centralized to allow for development of consistent standards, integration, and efficient use of resources.
- The Dean's Information Services Committee has two subcommittees (one for years one and two, the other for years three and four), with membership including the associate deans for information technology and education, faculty, information technology staff, and student representatives, is charged with assessing information technology needs for education and recommending resource acquisition and student policies regarding computer technology.
- The education focus has been on early stages of faculty development for conversion to computer-based teaching methods and developing students' skills in basic information management for the practice of evidence-based medicine.
- Resources for computer-assisted instruction are available in many courses, and laptop computers are lent to students for activities on some clerkships.
- A new library that opened in the spring of 2000 features a 60-station computer lab, laptops to check out, and docking ports with campus network and Internet access throughout the facility.
- As integration of computer technology for year-one and year-two courses and campus and community-based clinical sites increases, access to and skill with computer technology are becoming a necessary daily part of medical education.

Changes in Assessment

- Assessments using standardized patients (SPs) and physical teaching associates (PTAs) are conducted in years one to four.
- In the first year, students perform a videotaped comprehensive interview of an SP that is reviewed with faculty, a comprehensive physical exam assessed by a 300-item checklist, and a skills assessment in groups of three stu-

dents (group OSCE), demonstrating advanced interviewing and communication skills.

- In the second year, students conduct two comprehensive history and physical exams with SPs.
- Family medicine and internal medicine clerkships use the performance of the student with SPs as part of the student's grade. The surgery clerkship conducts a six-station summative OSCE for each student.
- At the beginning of the fourth year, all students are assessed by a ten-station OSCE, and any student who fails is required to complete an individualized remediation program.

Clinical Experiences

- Since 1994, students have begun working with standardized patients in their first week of medical school, and are provided clinical correlations in most of their first- and second-year classes. They are prepared for their first community-based experience by learning medical interviewing and physical examination skills working with SPs and PTAs.
- Students begin a longitudinal community-based mentorship with a generalist physician in their second semester (approximately two half-days per month, continuing through the second year). This mentorship also includes a required home visit, optional hospital rounds with their mentors, and optional visits along with patients to specialty consultants, treatment facilities, etc.
- The mentorship is part of the years one and two ITP course, which brings patients and sometimes their families to the classroom to discuss a variety of issues, from living with AIDS to team approaches to health care. In the second year, students visit public health departments and extended care facilities, investigate a mock epidemic in small groups at health department sites, and perform assessments of hospitalized patients.
- The integration of experiences with SPs and community-based clinical experience from the very beginning of medical school supports the assertion that "we no longer have preclinical students."
- The third year has been a traditional clerkship year, with rotations in the six major disciplines. Since the mid-1990s each clerkship has increased the amount of ambulatory experience for students, with an average of about one third of total clerkship experience in the ambulatory setting now. Some of this experience is in hospital ambulatory clinics, but most is in community-based office practices.
- EVMS owns no hospital, but provides clinical education for students in several area hospitals and other facilities, including the region's only children's hospital, Children's Hospital of The King's Daughters; Sentara Health System hospitals, Bon Secours hospitals, the Portsmouth Naval Hospital, and the Veteran's Administration Medical Center.
- During third-year clerkships all students have some experience with additional public health departments and an inner city "free clinic."
- During the fourth year, students have considerable flexibility of schedule, but new requirements since 1995 include a one-month primary care experience, one month of acting internship in a hospital, and one week of a substance abuse rotation that includes experiences with chemical abuse units and Alcoholics Anonymous meetings.
- A wide variety of electives is available, including experiences in all types of clinical sites, either at EVMS or at other U.S. or international medical schools; and longitudinal electives with generalist or specialist physicians, special populations (e.g., urban pediatrics and family-centered obstetrics), evidence-based medicine, or facilitating small groups for first-year students as a junior facilitator.

Curriculum Review Process

The last, formal, comprehensive curricular review and revision at EVMS was accomplished in 1993–94, stimulated by the desire to respond to perceived health workforce needs by increasing the emphasis on the education of generalist physicians.

- As a result of this interview, the educational program attempted to balance students' experiences with generalist and specialist physicians and with ambulatory and inpatient care as well as incorporating a generalist perspective into the didactic curriculum.
- The generalist emphasis was refined early to describe the knowledge, skills, and attitudes essential to the education of all physicians, not just those entering primary care. New courses highlighted early clinical experience and clinical correlations as the means of centering learning on patients and patient outcomes rather than on diseases in years one and two; integrating basic and clinical sciences; and encouraging active learning.
- During the 1990s the curriculum was shifted from nearly exclusively discipline-based educational offerings to multiple programs with interdisciplinary leadership and focus, including an increase in small-group and case-based learning emphasizing active learning methods. The curricular focus on human values, wellness, and personal and professional development was continued and expanded.

- The structure for accomplishing these curricular changes began with two interdisciplinary planning groups (addressing years one and two and years three and four, respectively) with representation from full-time basic and clinical science faculty, community faculty, other community members, students, and staff.
- A smaller interdisciplinary executive group integrated plans from the two groups and began implementation planning, spearheaded by the newly-appointed associate dean for education. Curriculum committee buy-in and approval were assured through cross-representation on planning committees and attention to redundant communication pathways.
- The development of interdisciplinary advisory groups to define the curricular needs for longitudinal themes in the new courses (e.g., community medicine, behavioral medicine, medical ethics, medical information systems, geriatrics) was successful, and continues as a means of developing and implementing new themes as they are identified (e.g., health economics/managed care, evidence-based medicine, sleep medicine, and genetics).
- A new position, longitudinal educational coordinator, was added to the Office of Education to assist with the development of these and other longitudinal experiences for students.
- As a result of defining these longitudinal learning themes for students, universal competency statements were identified that all six major disciplines accept as the learning goals for the clerkship year. These statements describe for students the skills to be examined in the fourth-year skills assessment.
- The school obtained two major educational grants in 1994: The Robert Wood Johnson Foundation Generalist Physician Initiative (RWJF-GPI) (as a member of the Virginia Consortium) and a grant from the Health Research Services Administration: The Interdisciplinary Generalist Curriculum (IGC) Project. Both of these provided added impetus (in the form of focus, leverage, and requirement for matching funds) for accomplishing the curricular revisions.
- The partial funding of six faculty specifically charged with implementing the aspects of the curricular revisions was instrumental in accomplishing the goals, as well as close interdisciplinary collaboration among the curriculum committee chairs, course directors, and clerkship directors. This process has been more fully described elsewhere, including challenges and unanticipated outcomes.
- The process for evaluating the effects of curricular change includes many methods that assess learners' knowledge, skills, attitudes, and satisfaction with educational programs; and effects on longer-term outcomes such as success in the National Interns' and Residents' Matching Program and students' discipline choices, practice sites, and populations.
- Both the RWJF-GPI and the IGC projects have provided external evaluations of our curricular changes; as do our accrediting bodies (the LCME and Southern Association of Colleges and Schools).
- Surveys of graduates are conducted to assess their retrospective satisfaction with their educational programs and surveys of their residency directors during graduates' internship year address their competency.
- The curricular change design has not included a control group of students, but historical measurements of student performances and satisfaction have provided most of the types of information that a control group would have.
- The major limitation of these methods is that, lacking a control group, the effects of an increasingly qualified group of matriculants and secular changes in the environment cannot be eliminated.
- The curriculum committees have the primary responsibility for continuous evaluation of educational quality and outcomes. The Year 1–2 Curriculum Committee is currently conducting an in-depth sequential review of first- and second-year courses, with attention to their interaction and integration with concurrent courses, student performance, and student satisfaction.
- A peer review project to train faculty to assess their peers' presentations to students and provide feedback is in progress.
- The Year 3–4 Curriculum Committee annually compares student performances and student satisfaction among the various clerkships, with feedback to clerkship directors and adjustments recommended when appropriate.
- As clerkship directors continually update the content of the clerkships, the committee reviews the overall topics for comprehensiveness, overlap, and adequacy in preparing students for subsequent stages of training.
- The Joint Curriculum Committee reviews the overall four-year educational program and intermediate measures such as EVMS graduates' responses to the AAMC Graduation Questionnaire and responses to the graduate survey administered annually by the Office of Education.
- The curriculum advisory groups described above provide intermittent reviews of their respective topic areas and their presentations across the curriculum.
- Periodic curriculum retreats allow all interested faculty to have direct input into long-term planning for the content and process of curricular presentation at EVMS.

Future Goals and Challenges

- The process of reviewing the educational program identifies recurrent themes that appear to exert a growing impact.

- The most significant is the perception that competing pressures for faculty time, most notably for clinical productivity or success in competing for research grants, affect the discretionary time available for teaching.
- There is the concern that processes for encouraging active learning, such as small-group learning and interactive large-group sessions, are more resource-intensive than are traditional lecture-based methods.
- Interdisciplinary teaching itself is more time-intensive, demanding increased time for communication and planning.
- Each of these resource-intensive activities competes at budget time with plans for enhanced utilization of computer-assisted learning and access to information-management tools, and with large ongoing budget needs for support of the standardized patient teaching and assessment program (Professional Skills Center).
- A significant challenge is to carefully weigh the value added by each of these excellent educational methods (small groups, electronic teaching methods, and standardized patient technology), and to judiciously allocate available educational funds.

Virginia Commonwealth University School of Medicine

JAMES MESSMER, MD, MED

Curriculum Management and Governance Structure

- There has been a concerted effort in the past ten years to involve faculty more in the governance and management of the educational program.
- Greater involvement has been accomplished by a change in the focus of standing committees and the development of new groups of faculty to explore ways to educate students better and to educate them in the areas that have previously received little attention. Rather than being simply informational, meeting agendas now encourage discussion of a wide variety of topics pertaining to medical student education.

Office of Education

- An Office of Curriculum has been in place for many years with the responsibility for overseeing the medical student curriculum.
- Historically this office dealt primarily with day-to-day management issues. In the past ten years there has been an increasing emphasis on educational research, with presentations at regional and national meetings.
- In 1999, two additional faculty members were hired. Their responsibilities include enhancing the educational research agenda and expanding our capabilities for computer-based instruction.
- A grant proposal has recently been submitted to the NBME.
- For the first time, one of the courses in the second year has been converted to an electronic format, with enhanced images and links to other Web sites.

Budget to Support Educational Programs

- There has always been a specific budget for the Office of Curriculum, but the main function of the office has been management.
- In the past several years additional money has been made available to the associate dean for medical education to fund individual faculty projects and use students in computerized program development. These efforts are funded through the School of Medicine using existing state money.

Valuing Teaching

- Four years ago the dean authorized the annual use of approximately $125,000.00 for faculty development for the course directors in years one through three of the curriculum.
- Each course director receives from $3–$5,000. This support is to be used primarily to enhance their personal development and to improve their particular courses. The faculty have used the money for a wide range of purposes, including purchase of computers/software, attendance at national and regional meetings, and improvements to individual courses.
- A faculty award program initiated in 1999 recognizes faculty for excellence in teaching basic science and clinical medicine, for serving as mentors, and for educational innovation. Awards consist of cash prizes and money for faculty development and can be as much as $3,000.
- Selected faculty in each course are awarded gift certificates for the bookstore for excellence in teaching as recognized by the students.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The faculty are still in the process of developing specific learning objectives.
- Meetings have been held over the past three years to discuss knowledge, skills, and attitudes, and we have relied heavily upon the AAMC's Medical School Objectives Project.
- The faculty are in the process of evaluating the MSOP objectives via a Web site survey with the goal of having specific objectives by fall 2000.

Changes in Pedagogy

- One of the most significant changes has been the use of computer-based instruction (CBI), as noted above. The faculty have been very active in developing their own CBI.
- The use of small-group teaching has increased further, most noticeably in our Foundations of Clinical Medical course.
- Standardized patients have been used in the past three years to teach and evaluate clinical skills.
- Didactic lectures in the first two years are limited to the morning, freeing the afternoons for independent study.

Application of Computer Technology

- Although medical students are currently not required to have computers, the undergraduate component of Virginia Commonwealth University has recently decided to initiate such a requirement. The School of Medicine will probably follow within the next two years.
- In 1990 a computer-based instruction lab was established, and this facility has grown tremendously in the past decade. Once simply a repository for commercially available CBI, the lab now serves as the cornerstone for faculty-generated computer projects.
- For the past several years, CDs with faculty-generated CBI have been distributed to all medical students. Some of these programs have received national attention.
- In the fall of 1999, the second-year Respiratory Course syllabus was converted to an electronic format with a variety of educational enhancements. The plan is to eventually convert all syllabi to this electronic format.

Changes in Assessment

- Standardized patients have been introduced in a formative evaluation during the Foundations of Clinical Medicine course.
- All second-year students take an OSCE at the end of second year.
- The school was one of the first to introduce computerized examinations, and currently ten examinations are given on computer over the first two years. This has allowed faculty to introduce images, refine security measures, and help prepare students for the computerized USMLE.

Clinical Experiences

- The single most important change in the education of our students has been the institution of the Foundations of Clinical Medicine (FCM) course. Started in 1995, this course is a longitudinal experience during the first two years that alternates a small-group session with a primary care physician one afternoon per week and a preceptorship experience with a community primary care physician one afternoon per week. Funded in part by The Robert Wood Johnson Foundation, the FCM course has provided our students with a level of comfort and skill far in excess of anything existing previously.
- Benefits of the FCM course have included students' increased appreciation for the relevance of the basic science curriculum and greater confidence as they enter their third year.
- Faculty comment frequently on the enhanced skills of the incoming third-year students.
- One purpose of the FCM course was to increase the number of students entering primary care fields. Historically approximately 40% of our students entered primary care fields; that number now stands at approximately 50%.
- Another significant change has been the increase in ambulatory care experience for the students. Whereas previously the third-year clinical experience was primarily hospital-based, students now have community experiences in internal medicine, family practice, and pediatrics.

Curriculum Review Process

- The theme of our curriculum renewal was to identify the knowledge, skills, and attitudes that our graduates should possess.
- Initially a small committee of faculty was established to identify the skills and attitudes appropriate for graduates. The results were presented and adopted at a school-wide retreat in 1996.
- A second effort, started at that retreat, was to identify the content of the curriculum. Using a series of surveys, faculty, students, house officers, and alumni were asked to identify and prioritize specific contents for the students.
- A working committee of 14 faculty and a series of subcommittees further defined the content, which was then fed back to the course directors.
- The medical school has been active in the MSOP consortium of schools, and the faculty have placed increas-

ing emphasis on the specific objectives developed through the MSOP.

- The working committee of 14 faculty has been discussing specific objectives, and recently the MSOP objectives have been made available to all faculty, some alumni, and students via the Internet. Feedback on those objectives will be used to formulate specific learning objectives for the school of medicine.
- The primary planning resource needed during this process was faculty time and energy. The dean provided the leadership and commitment necessary to make the project successful.
- The primary implementation resource was the energy of the faculty.
- One unanticipated outcome was the benefit of bringing basic science and clinical faculty together in an atmosphere of cooperation, which has led to a dissolution of communication barriers.
- Evaluation of the curriculum is an ongoing process that involves students as well as faculty. The use of standardized patients has been one successful new way that we have used to evaluate the results of our Foundations of Clinical Medicine course.
- Each course is evaluated at its completion by students and faculty, with changes initiated for the following year. Students recognize that their concerns are acted upon, and this has resulted in their enthusiastic participation in the evaluation process.

Future Goals

- One of the main areas that will be a point of focus over the next few years is the topic of humanism.
- In 1999 the concept of humanism was introduced into several areas of the curriculum.
- As part of the first-year orientation, students participate in a small-group session with physicians to discuss what it means to be a physician and a professional.
- Topics such as domestic violence, geriatrics, and alternative medicine have been introduced or expanded.

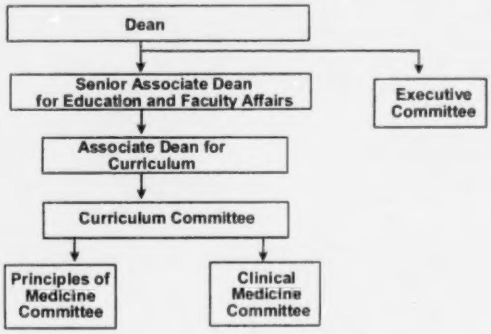
University of Virginia School of Medicine

DONALD INNES, MD, AND JERRY SHORT, PHD

Curriculum Management and Governance Structure

- In 1999 the school of medicine changed the decision-making process for the curriculum to allow for an integrated vision and to facilitate the implementation process for curricular change while enhancing faculty and student inputs into the design of the curriculum for both the content and the process of teaching and learning.
- The Council on Medical Education, a large, representative body without direct connection to the dean's office, was dissolved and replaced with the smaller Curriculum Committee to actively manage the curriculum through a process of monitoring, evaluation, and response.
- New responsibilities and lines of authority were established. The position of associate dean for curriculum, reporting to the senior associate dean for education and faculty affairs, was created (Figure 1).
- The Curriculum Committee is responsible for
  - defining the goals and objectives of the curriculum
  - the designing and managing of the undergraduate medical curriculum
  - establishing a process for reviewing, evaluating, and revising the curriculum on a recurring timeline to ensure that the curriculum is coherent, coordinated, fully integrated, current, and effective
- The committee makes recommendations to the dean about the system of incentives for teaching effort, salary support for faculty who teach, space required by the curricular design, and other support requirements needed to make the curriculum operational.
- The committee has the authority, with the approval of the dean, to set educational objectives, establish educational requirements, allocate curricular time, specify teaching methods, approve course directors, and evaluate educational outcomes.
- The committee has the authority to set performance standards for instructors, initiate faculty development efforts, and evaluate instructor performance.
- The Principles of Medicine and Principles of Clinical Medicine committees were established and made responsible to the Curriculum Committee and the dean for effecting the goals, objectives, and teaching responsibilities of the curriculum for each course and clerkship, and for the electives program.

FIGURE 1: New Curriculum Governance


Dean
Senior Associate Dean for Education and Faculty Affairs
Executive Committee
Associate Dean for Curriculum
Curriculum Committee
Principles of Medicine Committee
Clinical Medicine Committee

Office of Education

- Since the 1970s, the Office of Medical Education (OME) has provided education, evaluation, and administrative support to the educational program.
- In the 1990s, the OME expanded its role to include a standardized patient program, computer applications, the administrative support of clinical and ambulatory courses and clerkships, management of a learning center, and faculty development. These activities were added to continuing responsibilities for scheduling and maintaining instructional space, publishing a combined course schedule, scoring and analyzing tests, evaluating courses and instructors, and consulting with course directors and faculty about instructional design and evaluation.
- The OME supports the Student Advocacy Committee, which is devoted to ensuring a professional environment for all students, and the Mini-Med School, an educational program for the community.

Budget to Support Educational Programs

- The dean supports the educational program with funds to departments and discrete budgets to the offices of curriculum, medical education, admissions, and student affairs.

Valuing Teaching

- Salary support is provided to course directors, and other faculty receive credit for teaching on their personal effort reports. The plans for supporting teaching effort differ by department.
- There are a number of teaching awards:
  - The dean's office annually funds five faculty teaching awards, each consisting of a $2,500 stipend.
  - The dean's office and the university fund ten resident teaching awards annually, one for $1,000 and the others for $250.
  - The student body gives outstanding-teaching awards to a basic science instructor, a clinical instructor, and a clinical department each year, as well as providing additional awards to teachers in the first two years.

CURRICULUM RENEWAL PROCESS

The curriculum at the University of Virginia has been updated in recent years in response to changes in the medical practice environment and advances in scientific knowledge. The major revisions have included

- the development of a small-group problem-based course, Introduction to Clinical Medicine, in the second year, and the coordination of other second-year courses with it
- the development of a clinical medicine course in the first year
- the introduction of additional ambulatory and general clinical experiences in the first three years of medical school:
  - first year: afternoons in physicians' offices
  - second year: one-week preceptorships in physicians' offices throughout Virginia
  - third year: clerkships in family medicine and ambulatory internal medicine (one month each) at medical practices throughout Virginia
- the increased use of computers, information technology, and evidence-based medicine in courses
- the development of a generalist scholars program
- the use of standardized patients to teach and evaluate clinical skills (including the gynecologic and male urologic exams)
- the creation of a comprehensive clinical performance exam (CPX) given at the end of the third year to assess and improve students' clinical skills

Transforming Initiatives for 2000

Throughout the 1990s, students performances as measured by USMLE scores, CPX performances, residency placements, and ratings of graduates by residency directors remained high. For example, the students' mean USMLE scores remained above the national mean and student satisfaction as measured by school surveys and the AAMC Graduation Questionnaire was high. However, students and faculty expressed desires for

- more integration of courses, especially in the first year
- placement of basic science information in the context of clinical cases
- increased clinical experience and contact with patients in the first two years
- fewer hours of scheduled classes
- less time devoted to lectures; increased time devoted to small-group, problem-based learning
- more instruction by physicians in the first two years
- a mechanism to effect change in the curriculum

Learning Outcomes

- The Curriculum Committee adopted a set of objectives for undergraduate medical education based on findings of the 1998 University of Virginia School of Medicine Task Force on Medical School Objectives. These are presented below as competencies required of the contemporary physician. According to these objectives, to qualify for the MD degree the student should demonstrate the ability to:
  - develop and practice personal and professional attributes that enable the independent performance of the responsibilities of a physician, including the ability to adapt to the evolving practice of medicine
  - be competent in the human sciences:
    —in the understanding of current clinically relevant medical science
    —in the understanding of scientific principles as they apply to the analysis and further expansion of medical knowledge
  - engage and involve any patient in a relationship for the purpose of clinical problem solving and care throughout the duration of the relationship
  - elicit a clinical history, including consideration of the patient's use of alternative or complementary medicine
  - perform a physical examination
  - generate and refine a prioritized differential diagnosis for a clinical finding or set of findings
  - develop and refine a plan of care for both the preven-

tion and/or treatment of illness and the relief of symptoms and suffering

- develop a prognosis for an individual, family, or population based upon health risk or diagnosis, with and without intervention, and planning appropriate follow-up
- select and interpret clinical tests for the purpose of health screening and prevention, diagnosis, prognosis, or intervention
- organize, record, present, research, critique, and manage clinical information
- select and perform procedural skills related to physical examination, clinical testing, and therapeutic intervention
- understand the cultural, social, economic, ethical, legal, and historical context within which medicine is practiced

Changes in Pedagogy

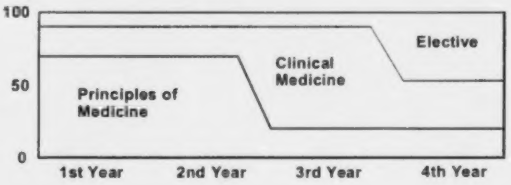
Currently the school is moving from an emphasis on content organized by disciplines delivered in large-group lectures to an emphasis on case-based, small-group, and interactive instruction.

- Current curricular innovations involve coordinating content with clinical cases, reducing the number of scheduled hours devoted to lectures, and providing more clinical experiences with patients, standardized patients, and virtual patients, for both teaching and assessment. The new integrated format is illustrated in Figure 2.

Application of Computer Technology

- Students are not required to buy particular models of computers, but they are required to have access to computers at home. Eighty-five percent of incoming students have computer access from home.
- A pilot group of third-year students received palmtop computers and medical software for the clerkship year.
- Students in the family medicine and ambulatory internal medicine clerkships receive laptop computers, appropriate software, and communication access during the two months they are away from the medical school in doctors' offices throughout the state.
- Computer and information technology to gather, manipulate, and apply knowledge is integrated into the curriculum rather than taught in a separate course.
- Computer training is offered to medical students on a just-in-time basis when a need arises. For example, e-mail accounts are set up during orientation and workshops are offered at the time students need to do their first medical literature searches for biochemistry, genetics, and epidemiology. This integrated approach considers the computer to be a necessary tool for physicians, with training provided at the time the tool is needed.

FIGURE 2: New Integrated 2020 Curriculum



- Most courses have Web pages, which include instructional materials such as notes, demonstrations, clinical cases, and quizzes.
- The Medical Education home page, ⟨http://www.med.virginia.edu/meded/MedEdHome.html⟩, provides students with a convenient gateway to all these Web-based materials.
- The computer staff of the OME has also developed an image database to be shared among courses and templates for clinical cases, quizzes, and other Web-based instructional materials.

Clinical Experiences

- Students are assigned to physicians' offices during the first three years of medical school, and many students take electives in ambulatory settings during their fourth year.
- All clerkships have inpatient wards and outpatient clinics with students integrated into the health care team.

Curriculum Review Process

A process for review of the curriculum has recently been instituted (1999).

Themes and Goals of Curriculum Renewal

Central to the medical education program at the University of Virginia School of Medicine is our vision (1) to attract, motivate and guide outstanding people by nurturing the

> dreams of those embarking on a career in medicine, (2) to engage the creative abilities of people to generate new knowledge and improve the quality of life, and (3) to foster excellence in medical education that blends compassion, technical ability and thirst for knowledge.
>
> Our primary reason for being is the education and training of physicians to help people achieve healthy and productive lives and to advance knowledge in the medical sciences.

These statements define the core values and purpose of the education program at the school of medicine. From these statements are derived the following goals and objectives of curriculum renewal.

Goals of Curriculum Renewal

- Create an environment conducive to learning core knowledge and skills and developing professionalism, appropriate attitudes, and social responsibility.
- Enhance the student's medical problem-solving ability and medical information management through use of information technology.
- Provide an experience of early and progressive student–patient contact and a context in which students learn patient-care skills and evaluate their own progress.
- Foster the creation of new knowledge through engagement of the student's creative abilities and exposures to a variety of clinical and research experiences, furthering an appreciation of the potential contributions of research to the diagnosis, treatment, and prevention of disease.

Objectives of Curriculum Renewal

- Integrate and coordinate basic science and clinical experiences horizontally and vertically throughout the four years.
- Create time for imaginative and creative expression in the basic sciences, in clinical medicine, and in service to the community, while including elective opportunities to explore the alternative pathways of general medicine, specialty medicine, and research.
- Achieve a balance of lecture, problem-based learning, patient experiences, and blocks of productive open study time to optimize the learning environment. Encourage a problem-solving approach to learning.
- Create time in the early years for regular and frequent patient contact, and integrate and coordinate patient experiences with the clinical sciences.

Planning Resources Required

- Dean's championing call for adaptation in medical education
- Dean's support of the teaching enterprise
- Management restructuring—new committees, responsibilities, and authority
- Mulholland Society—strong student government
- Retreats of faculty and students addressing educational issues
- Curriculum committee "open house" for faculty and students
- Curriculum Web page for communication with faculty and students

Implementation Resources Required

- Strong backing of curriculum changes by the dean
- Space for educational activities—lectures, small-group sessions, laboratory, self-study, computer facilities, recreation
- Faculty time and funding
- Strong administrative support for education by departmental chairs and service center directors
- Support for interdisciplinary educational programs
- Expanded educational design and development programs to support instructional development, e.g., computer programs, Web page construction, and audiovisual materials

Challenges and Unanticipated Outcomes of the Process

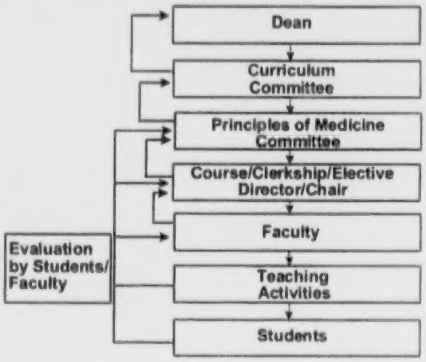
- Improved faculty communication
- Faculty recognition of need for adaptation and growth in medical education
- Improved management of information content, balancing an increasingly complex basic science background with essential humanistic values and skills needed for patient care
- Recognized need for an expanded faculty development program
- Increased enthusiasm of faculty to teach, counterweighed by clinical and research financial and time demands
- Perceived primacy of research and clinical service
- Difficulty of finding adequate numbers of faculty for small-group teaching
- Difficulty of finding faculty with the expertise needed to teach aspects of medical physiology, anatomy, neuroscience

Curriculum Review Process

One of the major tasks of the new Curriculum Committee is to develop a plan and a timeline for continuing evaluation and revision of the curriculum. In the past, there were many sources of evaluation data, but no comprehensive plan to review and act on the information in a systematic and timely manner. The school now has an effective mechanism to evaluate the curriculum and implement change when needed.

- Evaluation of the teaching process and evaluation of the outcomes of teaching are viewed as essential. Participants in the evaluation process include the dean; the Curriculum Committee; the Principles of Medicine and Principles of Clinical Medicine committees; the directors or chairs of the courses, clerkships, and electives; other faculty, and students. (See Figure 3.)
- The school uses a variety of evaluation resources (e.g., USMLE scores; course exams; clerkship evaluations; grades; shelf-exam scores; student evaluations of courses, clerkships, and faculty; AAMC Matriculation and Graduation Questionnaires). In addition, the school has created other evaluation resources:
  - Dean's Town Meetings (focus groups of students from all years)
  - Looking Back Surveys at the end of the second and third years, focusing on the curriculum as a whole rather than on individual courses
  - Student representatives on course committees
  - Annual student government report evaluating clerkships
  - Residency directors' evaluation of graduates at the end of PGY-1
  - OSCE for physical examination skills
  - Comprehensive clinical practice exam
- A major function of the Curriculum Committee is to review the data from evaluations of both teaching processes and outcomes to define areas that need improvement and to make recommendations or proposals, working through the Principles of Medicine and Principles of Clinical Medicine committees. The Principles of Medicine or Principles of Clinical Medicine committee responds to the recommendations or proposals from the Curriculum Committee as appropriate. This might be direct action on a request, a plan for action, or a call for clarification and/or a counterproposal. In all cases, a dialog is set up between the Curriculum Committee and the "Principles" and/or "Clinical" committees. Proposed changes to the curriculum are reviewed by the Curriculum Committee for adherence to the vision, goals, and objectives of the school of medicine. The committee provides guidelines to the course directors. The course directors translate the guidelines into working plans, and then, with the approval of the committee, put these plans into effect. The committee provides direction and may initiate change when basic structural modifications are necessary, especially when these changes cut across current course domains. Regular reviews by both inside and outside reviewers should ensure ongoing discussion of medical education and provide a mechanism to recognize and respond to change.

FIGURE 3: The Evaluation Process


Dean
Curriculum Committee
Principles of Medicine Committee
Course/Clerkship/Elective Director/Chair
Faculty
Teaching Activities
Students
Evaluation by Students/ Faculty

University of Washington School of Medicine

D. Daniel Hunt, MD, Bruce Ferguson, Debra S. Ketchell, ML, Fredric M. Wolf, PhD, and Paul G. Ramsey, MD

Curriculum Management and Governance Structure

- The University of Washington School of Medicine (UWSOM) is the medical school for the states of Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI). As such, the school addresses the needs of approximately 3.5% of the U.S. population that is dispersed across 28% of the U.S. landmass.
- A key component of the school's mission is " . . . Meeting the health care needs of our region, particularly by recognizing the importance of primary care."
- The management of curriculum across these geographically separate teaching and training sites has been a priority since the inception of the WWAMI program 30 years ago.
- At the school level, the Dean's Office of Academic Affairs is responsible for the education program.
- The Office of Regional Affairs and Rural Health (for WWAMI issues) and the Department of Medical Education assist academic affairs in this process.

Office of Education

- The Department of Medical Education (DME) was founded in 1967 as an office for medical education research to assist faculty with the improvement of the teaching and learning process.
- The "office" achieved departmental status in 1989.
- Today, the department's mandate has been broadened to include:
  - providing instruction to faculty and students through courses, faculty development workshops, performance-based teaching, and training medical education researchers and educators in the Teaching Scholars Program
  - conducting research into teaching and learning in a variety of settings
  - providing professional services to health sciences faculty, including course evaluation and test design and scoring
  - working in the medical school to develop innovations in biomedical and health informatics
- Key developments during the last decade have included
  - 1992—founding of the NW Center for Clinical Assessment within DME with support from the Josiah Macy Jr. Foundation
  - 1994—founding of the Center for Medical Education Research within DME with support from Health Research Services Administration
  - 1994—MEDEX Northwest joins the Department of Medical Education, bringing physician assistant education into the school of medicine
  - 1995—DME Teaching Scholars Program established
  - 1997—WAMI evolved into WWAMI; the program expanded to include Wyoming in the Regional Medical Education Program [by legislative mandates in Washington and Wyoming]
  - 1997—DME assumed expanded developmental and evaluative roles for the WWAMI Programs
  - 1997—Division of Biomedical Informatics established in the DME

Budget to Support Educational Programs

- There are four components of the budget supporting the educational program:
  - The Office of Academic Affairs (a component of the dean's office)
  - The Department of Medical Education (described above)
  - The WWAMI program
  - Departmental and interdepartmental courses
- The revenue sources supporting the budget components include:
  - State of Washington appropriated funds
  - WWAMI funds provided under contracts with the states of Wyoming, Alaska, Montana, and Idaho
  - Academic support funds at the school and department levels generated from clinical practice
- With the exception of the WWAMI contract funds, the revenue sources are not uniquely aligned with the budget components.

Valuing Teaching

- The school has a number of awards to recognize out-

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standing teaching; some are based on student nominations and selections, and some are based on peer recognition.

- ◆ Teaching service and performance is an integral consideration in promotion decisions. Most departments require that faculty develop and maintain teaching portfolios.
- ◆ There are also examples of innovative support of faculty engaged in medical student teaching. For example, the Department of Surgery has established a pool of funds that is distributed to faculty based on a formula that combines level of teaching effort and quality of teaching performance. Faculty may use these funds in support of their academic activities.

CURRICULUM RENEWAL PROCESS

- ◆ Curricular innovation in the area of addressing physician manpower shortages in rural areas has been an important focal point of the school's efforts over the past decade.
- ◆ There have been two parallel efforts to address the shortage of health care providers in rural regions: (1) efforts to increase the number of qualified applicants to medical school from rural and urban underserved areas; (2) efforts to increase curricular offerings within the school to encourage interest and prepare students for practice in rural and urban underserved locations.
- ◆ The effort to increase the number of medical school applicants from rural and urban underserved backgrounds stems from the finding in the literature that an applicant who has attended high school in a rural setting is more likely to practice in a rural setting.
- ◆ The school conducts six-week high-school-enrichment programs every summer for students from disadvantaged and/or rural backgrounds in Seattle, WA; Anchorage, AK; Moscow, ID; Bozeman, MT; and Laramie, WY.
- ◆ A six-week college-level enrichment program for students from disadvantaged backgrounds is also conducted in Seattle, often enrolling students who had been part of the high school program earlier in their education.
- ◆ When students are in medical school the curriculum must both maintain the students' interest and prepare them for practice in rural and urban underserved settings. To interest students and expose them to practice in rural and urban underserved settings there are a number of programs available.
- ◆ Between the time a student is admitted to medical school and the start of the first-year classes, the student is offered the opportunity to spend three days to a week with a rural physician in the Rural Observation Experience (ROE). Then with the first-year curriculum taught in each of the five states, there are more opportunities for rural preceptorships during the first year.
- ◆ Between the first and second years, over half of the class participate in the month-long Rural/Underserved Opportunity Program (R/UOP), which places students in rural and urban underserved settings, where they see the role of the physician in the context of the community. The student often lives with the physician and observes the balancing between professional and family life. During the third year, up to ten students can complete their usual third-year requirements in a unique program that has them studying for six months in carefully selected rural practices. This is the ultimate rural preparation experience and is called the WWAMI Rural Integrated Training Experience (WRITE). All other students may select from among dozens of community-based clerkships offered throughout the five-state region.

Application of Computer Technology

- ◆ Medical students are required to have computers.
- ◆ Many students have already developed computer skills during their high school and undergraduate years.
- ◆ Surveys conducted by the DME clearly show that at program entry basic computer skills have risen steadily over the past decade.
- ◆ Formal computer literacy training, for a self-selected few, begins during the months preceding matriculation with a 90-minute DME Basic Computer Skills Workshop for those in the school's Pre-Matriculation Program.
- ◆ Entering students with little or no computer background are encouraged to enroll in the Pre-Orientation Essential Computer Skills Workshop, approved by the HuBio Curriculum Committee in February 1999 and offered by the Health Sciences Library (HSL).
- ◆ During the first-year orientation week there is a series of three offerings. The first is the one-hour Connectivity and Software Orientation Session, conducted by HSL staff once prior to and several times during orientation week. The second is the three-hour Pre-Class Enrichment Computing Skills Workshop, offered by the HSL. Following competence placement, this workshop provides hands-on experiences and in-depth coverage of e-mail, file sharing, Web resources, web navigation, and use of Acrobat Reader for course readings. Finally, the HSL offers a one-hour information sciences session, the Health Science Library and Information Resource Orientation, which introduces matriculating students to HealthLinks, to traditional learning resources, and to recently digitized texts, reference books, and journals.
- ◆ Early in the fall of the second year, the HSL offers the

Refresher Orientation to Onsite UW Computing to second-year students from WWAMI sites.

- During the summer between the first and second years, Family Medicine and the HSL conduct the R/UOP Connectivity Session. In this session students are trained in remote connectivity for their own development and to enable them to involve preceptors as long as needed and as the preceptors desire. In general, this approach has provided a very productive opportunity for preceptors to develop skills.
- In the current preclinical curriculum, the most interactive use of Web-based instruction is by the Systems of Human Behavior course, microscopic anatomy–histology, pharmacology, and the skin-system course, and others. Many HuBio courses require Medline literature searches. A few are beginning to address evidence-based medicine (EBM).
- About 60% of HuBio courses use CD technology or interactive Web-based learning modules.
- In the clinical years, Family Medicine's innovative use of the First Class System for on-line problem-based learning, internal medicine's highly rated simulated performance assessment (which uses computerized patient management problems), and the psychiatry clerkship's Web site based on the HuBio 516/626 model are noteworthy examples of computer/informatics instructional applications.

Marshall University School of Medicine

PATRICK I. BROWN, MD

Curriculum Management and Governance Structure

- The Curriculum Committee consists of course directors from the basic science years, clerkship directors, and a peer-elected medical student from each class.
- The associate dean for academic and student affairs also serves as an ex-officio member to facilitate communication between the Curriculum Committee and other committees.
- Among its duties and responsibilities, the committee continuously reviews and evaluates the curriculum, and recommends appropriate changes to the curriculum.
- The committee also reviews and evaluates proposed changes and devises methods of implementing those changes deemed necessary to fulfill the goals and objectives of the Marshall University School of Medicine (MUSOM).
- Complementing the Curriculum Committee and focusing principally upon clinical education are the Oversight, Comparability, and Evaluation Committee and the Coordinating Committee for Clinical Education (CCCE).
- The oversight committee is an executive committee of academic affairs, ensuring the comparability of learning experiences at all clinical teaching sites.
- The CCCE, a subcommittee of academic affairs, consisting principally of clerkship directors, defines the objectives of clinical education and develops measures to assess students' overall clinical performance. The committee has created an examination (using standardized and computer-simulated patients) to determine the minimal clinical competency levels appropriate for our students at the end of Year three.
- The CCCE provides timely reports to both the curriculum and oversight committees.

Highlights of Overall Curriculum Changes

- Consistent movement toward enhancing computer-based instruction in all basic science and some clinical courses
- Development of a statewide Web-based rural student-placement–tracking system to aid in determining placement availability of rural sites and preceptors
- 26 new courses developed or revised
- Implementation of policy requiring personal computer ownership for students
- Development of the curriculum database
- Development of the Web-based student handbook
- Revised curricula with course content on rural practice, rural communities and populations, and interdisciplinary team-building skills, as well as expanded rural clinical rotations
- State mandate that all system-supported health sciences students, except those in dentistry, must complete a minimum of three months of clinical rotations in rural areas of the state

Highlights of Year Four Curriculum Changes

- Planning and implementation of a senior symposium, beginning with the class of 2001
- Revision of the emergency medicine requirement
- Development of 18 new electives
- Development of the independent-study USMLE Step 2 review course and the Essentials of EKG course
- Completion of the Web-based Student Elective Handbook
- Vigorous support of ERAS to aid in the student residency match program
- Implementation of a three-tiered approach to senior student professional counseling: rising MS IV meetings followed by a Year-four sign-up day for fourth-year courses and residency advisors
- Development of an integrative and complementary medicine elective
- Implementation of a 30-day rule regarding fourth-year student-schedule changes

Highlights of Year Three Curriculum Changes

- Reorganization of the Four-Week Transition to Primary Care (TPC) course to one-week clinical orientation (CO)
- Inclusion of advanced cardiac life support (ACLS) during clinical orientation
- Planning and implementation of the Marshall Primary Care Curriculum (MPCC)
- Revision of the nine-month RPAP program to a six-month RHEP program, then to the MPCC program with rural option

- Development and implementation of a competency examination to assess clinical reasoning skills in rising year-four students using computer-based testing and standardized patients
- Web-based posting of student clerkship schedules
- Implementation of the state's first Rural Clinical Health Fair (now all health professional schools offer this RHEP event)
- Administration of a mid-year NBME Comprehensive Clinical Examination as a barometer to measure student USMLE Step 2 preparation
- Reduction of required months of rural experience from four to three to bring MUSOM in line with state policy
- Incorporation of risk management and legal issues into the year-three curriculum
- Incorporation of medical ethics into the year-three clerkship curriculum
- Development and refinement of the clinical curriculum for rural sites, including syllabus, preceptor manuals, student checklist, and evaluation instrument for preceptor and sites

Highlights of Year Two Curriculum Changes

- Introduction of USMLE Kaplan Review Course for all year-two students funded solely by MUSOM
- Implementation of a year-long clinical mentoring program
- Inclusion of a medical ethics course
- Utilization of standardized patients in an observed physical examination (final exam for the physical diagnosis course)
- Integration of professionalism, risk management, the physician–patient relationship, and the role of personal responsibilities of physicians
- Incorporation of year-long clinical mentoring and precepting to facilitate integration of education content and provide role models who practice longitudinal patient care

Highlights of Year One Curriculum Changes

- Incorporation of year-long clinical mentoring and precepting to facilitate integration of education content and provide role models who practice longitudinal patient care
- Refinement of biostatistics and epidemiology and inclusion in the Introduction to Patient Care course
- Renewed emphasis on preventive medicine
- Inclusion of a medical ethics course
- Introduction of Spirituality and Medicine course incorporated in the year-one curriculum
- Integration of alternative and complementary medicine into the year-one curriculum
- Incorporation of a separate interdisciplinary medical cell and molecular biology course that is team-taught by four departments
- Integration of the physiology and neurophysiology courses
- Incorporation of a separate course on human sexuality
- Introduction of interviewing and physical examination skills

Office of Education

- An office of medical education was dissolved by a former dean and eventually replaced with the combination Office of Academic and Student Affairs during the late 1980s.
- The office now includes responsibilities for evaluation, curricular management issues, student registration and academic performance issues, rural programs, admissions, and career and emotional counseling.

Budget to Support Educational Programs

- There is no separate budget to support the educational programs.

Valuing Teaching

- An interdisciplinary Faculty Development Committee was formed in 1996 to address faculty development needs.
- Initially sponsored by funds from the Interdisciplinary Generalist Curriculum and the dean's office, a core group of faculty attended a week-long workshop on effective teaching. Upon return to MUSOM, these faculty conducted twice-yearly workshops on effective teaching for basic and clinical faculty.
- The efforts of the Faculty Development Committee have included workshops on presentation skills, better utilization of multimedia in the classrooms, the "one-minute Preceptor," question writing, and how to integrate basic science and clinical information. Last year, a teaching expert presented a seminar on Web-based lectures, followed by a workshop. This year the program was ex-

panded to six workshops plus one invited expert who facilitated four workshops.

- To ensure that the needs of the faculty are being met, the committee surveys all faculty to identify future workshop and/or mini-seminar topics. The Committee works closely with the Division of Continuing Medical Education (CME) to offer CME hours to participants. Participants evaluate each event.
- The class of 1987 established the Society of Outstanding Teachers to identify and recognize deserving faculty members. However, over the past several years, the graduating classes have opted not to continue this form of recognition. In its place, each class now presents annual awards recognizing outstanding faculty, residents, and departments.
- The annual awards are given in by the senior class during the spring Awards Ceremony and the other three medical classes present their awards during the fall White Coat Ceremony.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The Oversight and Curriculum Committees appointed an interdisciplinary subcommittee to develop a draft of institutional goals and objectives for review by faculty and students. Comments were obtained and the subcommittee made appropriate changes. Two town meetings were also held to facilitate discussion and ownership of the objectives.
- The faculty voted on and approved the institutional goals and objectives at its spring 2000 General Faculty Meeting.

Changes in Pedagogy

- A number of significant events over the past decade have resulted in changes in educational strategy. The events include, but are not limited to, the Kellogg grant, the preventive cardiology academic award, and the Interdisciplinary Generalist Curriculum.
- These curricular development grants created initiatives in interdisciplinary teaching, small-group teaching; problem-based learning, and mentor teaching programs.
- To promote interdisciplinary teaching, several basic science courses (e.g., Introduction to Patient Care and Gross Anatomy; Introduction to Clinical Medicine and Pathology) are now integrated.
- Several basic science and clerkship courses provide opportunities for small-group learning and problem-based learning. Mentors reinforce classroom concepts and skills in the field and serve as role models and teachers.
- The clinical experiences provide numerous examples of how the basic sciences are relevant to medical practice. This reinforcement and integration of curriculum content enhances student learning.
- The new medical center offers a better clinical environment in which to teach.
- The state-of-the-art library facilities provide electronic document delivery. Upon matriculation, all students are required to own computers, allowing teaching methods to include computer-based instruction.
- Learning resources are provided for students via the Internet on a routine basis. These efforts promote the development and maintenance of independent learning skills.

Application of Computer Technology

- Students are required to own computers and are given a day-long orientation to the MUSOM network and its resources (including electronic mail, Web services, etc.) prior to the start of classes during their first year.
- The Division of Information Technology and Medical Informatics supports MUSOM's efforts to integrate information technology throughout its curriculum.
- An integrated, searchable, enterprise directory provides e-mail address look-ups for both students and faculty, and the school maintains several e-mail discussion lists for student classes and organizations.
- During clinical orientation, which is offered at the beginning of year three, students are given training sessions focusing on electronic clinical resources.
- At the end of their third year, students take a Web-based clinical competency exam to evaluate their medical decision-making skills. This exam incorporates a multimedia physical examination and laboratory and radiologic findings such as heart and lung sounds and digitized x-rays.
- During their fourth year, students may elect a two- or four-week Introduction to Medical Informatics clerkship, a Web-based educational experience that provides in-depth coverage of such topics as the electronic medical record, telemedicine, and clinical decision making.
- The Office of Academic and Student Affairs maintains a number of informational technology (IT) resources in support of student education, including a Web-based stu-

dent calendar and an anonymous "comments" page, which allows students to share concerns openly with faculty and administration.

- The Health Science Library provides an electronic document delivery service, Web-EDD, to both students and faculty at the school of medicine. This service allows users to order and receive articles via a Web-based interface.
- Developments slated for the 2000–01 school year include: computer-based testing for exams in selected first-year courses and Web-based, streaming, video distribution of lectures in both the clinical and the basic sciences, and the continuation of a specially funded program that has provided 3Com Palm III personal digital assistants (PDAs) to selected third-year students as bedside references.

Curriculum Review Process

- Through the Curriculum Committee, a formal process is in place for ongoing review of the education program.
- In addition to student evaluation of courses and faculty, the Curriculum Committee has conducted student surveys of the overall curriculum to assess students' perceptions of basic science course preparation for USMLE Step 1.
- A similar survey has been developed for students' perceptions of the curriculum as it relates to preparation for USMLE Step 2.
- In-house exit surveys for graduating seniors and data provided by the AAMC are also well-established mechanisms for review of the curriculum.
- The Curriculum Committee has begun to foster dialog between basic scientists and clinicians to identify essential knowledge and the degree that this knowledge is efficiently addressed in the current curriculum.
- In addition to the methods described above (e.g., student evaluations of courses, exit surveys), the Curriculum Committee is in the process of establishing a review team for each course. This team, consisting of the course director, a basic scientist, and a clinician, will be responsible for integrating all of the evaluation data and reporting to the committee as a whole.
- Redundancies and deficiencies in the curriculum will be identified and corrected. Extensive deliberations by the Curriculum Committee have resulted in ongoing improvements of the teaching environments in the year-one and year-two classrooms.
- The Office of Academic Affairs continues to monitor student evaluations of rural preceptors and sites. Copies of the evaluations are provided to the appropriate departments and site coordinators.
- With the establishment of institutional goals and objectives, an intensive curricular renewal effort is envisioned within the near future. The process will include input from students, faculty, and staff.
- The challenge encountered in reviewing any initiative proposal is to gain support from appropriate committee(s), faculty, and administration.
- Since most initiatives involve new funding, support from the administration is also imperative.

Future Goals

- There are several issues to be addressed during the next five years. With ever-present demands to attach curricular content without adding more time to an overloaded educational program, teaching efficiency must be increased.
- The changing demands of medical practice and the pressure on clinicians to earn more income decrease potential teaching time. This, in essence, may relegate teaching to less than top priority.
- Mechanisms to recognize and reward teaching need to be developed.
- Curricular changes that promote clinical reasoning skills and lifelong learning need to continue.
- Methods to evaluate noncognitive skills need to be developed and implemented throughout the educational program.

West Virginia University School of Medicine

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Curriculum Management and Governance Structure

- Since 1990, the management of the curriculum has become more centralized. This more centralized management resulted in a major revamping of the curriculum for the first two years.
- Departments and faculty who want to make changes in the curriculum consult the associate dean for medical education.
- The Curriculum Committee and the associate dean for medical education now manage the educational program.
- The Curriculum Committee reviews recommendations for changes in the curriculum.
- The Curriculum Committee, working with the associate dean for medical education, recommends curricular changes to the dean.
- If a recommended curricular change is major, such as a "new" curriculum, then the faculty is consulted. The faculty meet to discuss and vote on major curricular changes.
- The dean, through the associate dean for medical education, also may seek advice and guidance on curricular changes from the executive faculty (chairs) of the School of Medicine.

Office of Medical Education

- Recommendations from the Curriculum Review Task Force, the Education Strategic Planning Committee, and the Curriculum Committee resulted in the establishment of the Office of Medical Education in 1998.
- The Office of Medical Education (OME) is an academic support unit located administratively in the dean's office of the school of medicine.
- The mission of the OME is to foster excellence in medical education, to contribute to the knowledge base that informs decisions in medical education, and to support the educational mission of the school of medicine.
- The Office of Medical Education contributes to realizing the overall vision of the school of medicine—"Changing to care better for those we serve: students, patients, and community."
- The OME staff works with faculty to provide leadership in curricular development, instructional development, program evaluation, student assessment, and research in medical education.
- In collaboration with the school of medicine faculty, the OME enhances the educational programs in the school of medicine by
  - improving current teaching, learning, and evaluation in medical education
  - improving the measurement and recognition of faculty members' educational contributions
  - assessing outcome measures of educational progress for students and faculty
  - promoting and conducting scholarship and research in medical education
  - disseminating information about medical education
  - assuring continuing accreditation and excellence in the educational program for the MD degree

Budget to Support Educational Programs

- There is not a discrete budget identified to support the educational program at the present time. However, the situation will change in budget year 2000–2001.
- The WVU School of Medicine has implemented the mission-based management program, which will create reporting tools to measure financial performance and productivity on a mission-specific basis at three levels: school, department, and individual faculty member.
- Equipped with improved measuring and accounting systems, the WVU School of Medicine will be better able to fund programs on a mission basis. As a result, the education mission will have its own identified and discrete funds that will be based on need and productivity in the delivery of educational programs.
- Funds will be drawn from state, practice plan, hospital, grant, foundation, and other sources to fund the education mission as the School goes to an all-funds budget, another outcome of participation in the mission-based management program.

Valuing Teaching

- Department chairs and course/clerkship coordinators identify faculty who make significant teaching contributions. The associate dean for medical education recommends to the dean that they be recognized for their efforts.

- Recognition includes letters for their files, compensation for outstanding teaching contributions, and departmental and school teaching awards.
- Clinical faculty whose primary responsibilities are for course direction are compensated for their time by the dean's office to offset clinical dollars that may be lost because of the time and contribution they put into the teaching program.

CURRICULUM RENEWAL PROCESS

- The themes and goals of the curricular renewal effort resulted from a vision to become more student-centered in teaching strategies and to focus on student learning. That effort resulted in a basic science curriculum characterized by the following changes:
    - The lengths of the first and second years of medical school were increased with no change in contact hours.
    - The basic sciences were integrated and modularized into blocks.
    - Patient-related experiences and associated small-group discussions were provided in the second week and beyond.
    - Active learning opportunities, including weekly PBL sessions, were increased.
    - Lease/purchase of laptop computers was required of all incoming first-year medical students.
- The actual process to get to these changes started early in the last decade and can best be described by the following chronology of events:
    - 1991: the Curriculum Advisory Council described the state of educational affairs at that time.
    - 1993: The school was reviewed by the LCME, which expressed concerns about
        —the role of the Curriculum Committee in addressing the curriculum as a whole
        —the need for integration of the basic and clinical sciences
        —the need to create more opportunities for active learning
        —the appropriate reduction in the large number of scheduled hours in the first two years
    - 1994: The first-year basic science faculty started using PBL.
    - 1995: The Curriculum Review Task Force made recommendations that would serve as the foundation for the future changes.
    - 1996: The Education Strategic Planning Committee recommended goals and objectives for the education mission of the School. A day-long faculty curriculum retreat was held.
    - 1997: The Curriculum Committee recommended significant changes in the education of medical students during their first two years. The provost approved the change in the School of Medicine academic calendar. The recommended changes were endorsed by the executive faculty of the School of Medicine. A faculty forum was held. Faculty approved the curricular changes by unanimous vote.
    - 1998: The WVU Faculty Senate approved the new curriculum and courses. First year of curricular changes implemented in the fall.
    - 1999: Second year of curricular changes implemented in the fall.
- Among the unanticipated outcomes of the process was a camaraderie that developed among the faculty from different departments as they cooperated and worked as a team to develop the integrated basic science courses. Faculty became more interested in learning how to teach well.
- The challenges of the changes in the curriculum were the scheduling of the new first- and second-year modular blocks, which did not conform to traditional college semester schedules; meeting expectations and needs for faculty development; and providing timely and hands-on support for faculty using new information technologies in the classroom.
- One of the recommendations of the Curriculum Committee for adopting the new curriculum was that it be evaluated after it has been fully implemented.
- The school of medicine is designing a system to identify the expected learning outcomes, developing various measurement strategies to assess changes, and developing a "user-friendly" database to capture data for short- and long-term curricular improvement.

Learning Outcomes

- The faculty has not identified specific learning outcomes students must demonstrate prior to graduation at the present time.
- The dean has asked that an education strategic plan advisory board be formed and charged with developing the process to determine specific student learning outcomes.
- In 1996 the Education Strategic Planning committee recommended the following goals and objectives for the

education mission of the school. These goals and objectives are the ones being followed today:

- Graduate professionals who demonstrate integrity and compassion and who acknowledge an obligation to society. It is necessary but not sufficient to graduate physicians and scientists who are only intellectually prepared and technically proficient. It is also an important part of the medical school process that our learners be instilled with a sense of responsibility to individual patients and to society as a whole. It is easy to lose sight of this goal within rigorous curricula, which demand the mastery of large amounts of rapidly changing information. With the exception of a single second-year course, these issues are largely dealt with informally, without explicit educational objectives.
  —Objective 1.1: Weave an appreciation of ethical issues throughout the curriculum.
  —Objective 1.2: Provide an environment where students and residents can develop their potential to become community leaders.
- Promote the acquisition and use of lifelong learning skills on the part of students, residents, and graduate students. Our students need to become actively involved in the learning process. As educators, we need to be flexible in allowing them to pursue individual learning interests and creating an atmosphere where they can achieve to their highest potential. To guide their patients toward effective, affordable health care, our graduates will need to be able to apply innovations and to limit the use of interventions without proven benefit. That is, their practice of medicine will need to be based on current evidence. We also need to provide our graduates with opportunities to improve their skills through high-quality, continuing medical education.
  —Objective 2.1: Develop competent, self-directed learners.
  —Objective 2.2: Develop knowledge, attitudes, and skills to practice evidence-based medicine.
  —Objective 2.3: Improve continuing medical education opportunities for health care providers throughout the state.
- Stimulate interest of medical students and residents in practicing primary care medicine, especially in rural areas of West Virginia. There is widespread agreement that we need to increase the number of primary care physicians in proportion to specialists. The key components of the provision of primary care are continuous and comprehensive care by the health care provider. It is important that schools of medicine teach a set of core competencies in primary care for all of their graduates regardless of discipline. There is also the significant problem of maldistribution of the physician workforce, and we have a responsibility to try to address this problem in our state.
  —Objective 3.1: Increase exposure to primary care, and start it earlier in the curriculum.
  —Objective 3.2: Provide students and residents the principles of and experience in managed care.
  —Objective 3.3: Maintain the rural primary care requirements of the West Virginia Rural Health Education Partnerships (WVRHEP) for medical students.
- Emphasize the importance of disease prevention and health promotion. Preventive medicine is an important part of primary care. Because students will need to counsel their patients about healthy lifestyles, it seems only logical that we encourage our learners to adopt and practice healthy lifestyles. Students also need to appreciate the science behind disease prevention and health promotion and to learn to employ the knowledge base of epidemiology in the delivery of health care. Students will need to involve their patients in the decision process, understand the principles of screening populations for disease, interpret the relevant literature, and appreciate the costs and benefits of different approaches to prevention.
  —Objective 4.1: Emphasize preventive medicine/health promotion.
  —Objective 4.2: Apply the principles of epidemiology to disease prevention.
- Recognize and reward the teaching of students and residents. The accomplishment of the multiple missions of an academic health center creates a tension that is transmitted throughout the Health Sciences Center. To accomplish our mission most effectively, our reward and recognition systems must be congruent with our values, goals, and priorities.
  —Objective 5.1: Create an environment that emphasizes a scholarly approach to curricular development, implementation, and evaluation.
- Foster programs where graduate students, medical students, and residents can be educated as scientists, researchers, and educators. Research is a fundamental component of the education we provide to all our students. Therefore, research theory and experiences should permeate the entire curriculum. Maintaining the vitality of research programs thus becomes an important educational priority. It is particularly important to highlight the educational value of research programs because it is a point of intersection between two components of our Strategic Plan.
  —Objective 6.1: Enhance the research experiences and opportunities throughout all educational programs.

Changes in Pedagogy

- The lengths of the first and second years of medical school were increased with no change in contact hours. The purpose of that strategy was to decompress the curriculum, to increase clinical material, and to allow students more self-learning time.
- Patient-related experiences and associate small-group discussions were provided in the second week of medical school and beyond.
- Lease/purchase of a laptop computer was required of every incoming first-year medical student, to help students learn and use the information technology essential to the modern practice of medicine and to urge faculty to use computers in their teaching.
- There has been a significant increase in the amount of small-group instruction.
- Problem-based learning now occurs weekly throughout the year in both first and second years. There are additional small-group learning experiences in the Human Function course (first year) and in pharmacology (second year).
- Cases are the foundation for the problem-based-learning sessions, and cases are used in the large-group presentations during the clinical clerkships.
- Standardized patients are used in the teaching of physician–patient communication and physical diagnosis. These skills are taught in the Introduction to the Patient course (first year) and in the Physical Diagnosis and Clinical Integration course (second year).
- Standardized patients are used in second- and third-year OSCEs.

Application of Computer Technology

- Beginning in the fall of 1998, incoming medical students have been required to lease/purchase laptop computers. The student laptop program was begun to prepare students for the practice of medicine in the future and meet today's demanding instructional needs using the advantages that this tool can provide. Major advantages of the program are the use of standard computers with uniform hardware requirements for integration, HSC network support, and ease of service.
- Faculty have entirely revamped the first and second years, put up most of the course material on the Internet, and provided students with single-point-of-entry access to software resources. Where server-based materials were too slow to read, CD-ROM versions of the software were made available.
- Web-based materials include syllabi, notes, lecture materials (PowerPoint), access to instructional software, computerized discussion groups, and computer-based tests.
- The laptops are used for the problem-based learning sessions and students have overwhelmingly found them to be of educational and communicative value (e.g., for e-mail, discussion groups, and instructional software accessibility).

Changes in Assessment

- The assessment methods to measure student achievement have not changed significantly over the past five years.
- During the basic science years, multiple-choice, matching, and short-answer examinations have migrated from paper to computer administration.
- Standardized patients are used for student teaching and assessment in the first-year Introduction to the Patient course and in the second-year Physical Diagnosis and Clinical Integration course.
- Faculty observation of clinical skills remains the mainstay of assessment during the clinical years.
- Some clerkships have begun to experiment with the use of OSCEs as an assessment method.
- An OSCE is being used in the second-year Physical Diagnosis and Clinical Integration course.
- It is envisioned that a school-wide OSCE will be designed in the near future to assess clinical competence before students graduate.
- Other examination methods include self-assessment (used during PBL) and Critically Appraised Topic (CAT) papers (used in the evidence-based medicine course).

Clinical Experiences

- Much of the students' third- and fourth-year clerkships takes place in ambulatory care facilities.
- On the Morgantown campus, students see patients in the Physician Office Center (POC), a large multispecialty practice owned and operated by the WVU physician practice plan.
- During the third- and fourth-year rotations, students spend three months in community-based primary care settings as part of the West Virginia Rural Health Education Partnerships (WVRHEP).
- The WVRHEP consists of 13 training consortia of community-based clinics, private medical practices, and social and educational agencies covering 47 of West Vir-

ginia's 55 counties. Each of these consortia has its own local board of community members and providers who implement state policies at the local level. The network includes more than 250 community-based health, social, and educational agencies and almost 500 field faculty, teaching and practicing locally.

- While on rotation students spend 20% of their time in interdisciplinary case management sessions, community service learning, and community-based research.

Curriculum Review Process

- The school has a formal process in place for the ongoing evaluation of courses and clerkships. Each year several in-depth course/clerkship reviews are scheduled.
- Significant features of the reviews include comprehensive self-study of the course/clerkship(s) conducted by the departments, the establishment of standards or expectations of performance by the departments, examination of a wide range of instructional data, external review, and a departmental retreat.
- At the end of a complete curriculum review cycle, estimated to be approximately six years, each required course and clerkship will have received an in-depth review, and the cycle will begin again.

Future Goals

- The major issues likely to be addressed in the next five years are: (1) identification of short- and long-term student learning outcomes (academic and professional); (2) the assessment of clinical competence; (3) design of a longitudinal system for outcomes measurement; (4) review of the clinical clerkships for consistency, collaboration, and completeness; and (5) implementation of a common longitudinal conference series for the third and fourth years of the curriculum.

Medical College of Wisconsin

KAREN MARCDANTE, MD

Curriculum Management and Governance Structure

- The Curriculum and Evaluation Committee (CEC) is a standing committee of the Faculty Council and is responsible for design, management, and evaluation of the undergraduate medical curriculum.
- The CEC evaluates all proposals for change of existing curricular policies/programs or addition of new policies/programs. It is charged with completing annual evaluations of courses and clerkships and assuring the quality of the educational offerings of the medical school.
- The CEC consists of 13 faculty members (eight elected, and five appointed) and five student representatives.
- The Faculty Council is an elected, representative body. Each department has one to three representatives, based on departmental size. (Departments with fewer than 50 faculty have one representative, those with 50–99 faculty have two members, and those with more than 100 faculty have three members). The Student Assembly and Graduate Student Association elect one member each. The council may choose to grant representation to no more than five organized faculty groups having unique concerns or issues not adequately represented by other elected members.
- The Faculty Council has the responsibility for formulating recommendations regarding standards of admission, promotion, graduation, suspension, and discharge or public censure of students; criteria for promotion and tenure of faculty; and requirements for degrees granted by MCW. It makes recommendations regarding academic policy and faculty welfare and establishes, directs, and/or disbands standing committees and oversight committees.
- The Faculty Council reports to the Executive Committee of the Faculty (ECF) composed of the department chairs, the dean of the graduate school, and the senior associate deans of academic affairs, clinical affairs, and graduate medical education. In addition, the presidents of the Faculty Council and the Student Assembly are members of the ECF.
- The Executive Committee reports to the dean of the medical school.
- The senior associate dean of academic affairs leads the Office of Academic Affairs. The associate deans of curriculum, educational support and evaluation, minority student affairs, and student affairs report to the senior associate dean, who reports directly to the dean.
- Course directors and clerkship directors are directly responsible for daily activities within their courses/clerkships, including content, method, and evaluation.
- Since 1990 the following changes have occurred:
    - The Faculty Assembly (with all faculty having a vote on issues) was converted to a representative Faculty Council.
    - The position of associate dean for curricular affairs was reinstituted.
    - An associate dean for educational support and evaluation was appointed.
    - Department chairs were appointed to the Curriculum and Evaluation Committee (CEC) to enhance communication between the CEC and the leadership.
- The creation of the Course and Clerkship Directors Committee has resulted in shared information and decreasing major discrepancies between courses/clerkships within each year. It has also resulted in creation of a single evaluation form (completed by students) to allow comparative data between courses and clerkships.

Office of Education

- The Office of Curriculum was established in 1977, then absorbed into the Office of Student Affairs in 1982. The Office of Educational Services was added in 1984 to consolidate functions of research and faculty development and to provide a study skills specialist.
- Known under various titles, the Office of Curriculum was reintroduced in 1989, reporting to the senior associate dean for academic affairs.
- During the 1990s the office provided consultation and support services for faculty, while the Office of Student Affairs provided student support services. Enhancements include federally funded faculty development programs since 1991, a fellowship in medical education (1992), annual orientation to medical education for new faculty (1996), and a faculty mentor program (1999).
- The Office of Academic Affairs oversees student affairs, minority student affairs, curriculum, educational services, student financial services, admissions, and the registrar.
- In 1999, the associate dean for volunteer clinical faculty (reporting to the senior associate dean of academic affairs) was appointed.

- The offices of educational services and curriculum are currently involved in implementing curricular revision, faculty development (including preparing faculty for promotion), coordination of the standardized patient program, and technology applications for medical education and support of courses and clerkships (including design and evaluation).

Budget to Support Educational Programs

- Money is designated by the dean for educational initiatives, including: the standardized patient program, introduction to the clinical exam, and the Clinical Continuum. Money from the dean also supports the Society of Teaching Scholars.
- Money from the dean supports half-time FTE positions for the senior associate dean of academic affairs, associate deans of curriculum, educational support and evaluation, minority affairs, and student affairs, and for the director of educational services.
- The associate dean for volunteer clinical faculty is funded by the Dean as a 0.2-FTE position.
- The dean funds professional and classified staff positions in the Academic Affairs offices.

Valuing Teaching

- Faculty development programs provide support for faculty interested in careers as educators.
- The dean has made money available to support innovative educational projects submitted to and evaluated by the Curriculum and Evaluation Committee. Outcomes of projects are peer-reviewed, and one or two projects are recognized at convocation each year. (Recipients receive a plaque, a small monetary award, and recognition through a school-wide publication.)
- In 1992, the school initiated the Society of Teaching Scholars. Three faculty are elected by peers for their educational excellence each year. Those elected are recognized at convocation and receive a small monetary award and a medallion symbolic of their recognition. The scholars also sponsor an annual education symposium.
- Student-selected awards for teaching excellence are presented to basic, clinical, and community faculty at commencement and announced again at the following convocation.
- Throughout the 1990s, departments increased the number of awards for excellence in education of residents and students.
- Student-selected teaching awards for excellence are presented to student-selected housestaff by the graduating class.
- Service to the institution through work as an educational administrator or on various education committees is recognized in the promotion process.
- In the mid-1990s, selected departments linked faculty incentives to educational accomplishments.
- In 1997, tenure was made available for faculty promoted in the clinician–educator track.
- In 1999–2000 promotion criteria specific to clinician–educators were developed, enhancing the recognition of evidence for educational achievement.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- In 1996–98, education leaders, students, and administrators met in a series of retreats to identify educational objectives for all four years of the curriculum.
- The objectives have been approved by the CEC.
- All CEC members, course and clerkship directors, and students receive these objectives.
- The third- and fourth-year objectives have been translated into behavior-anchored evaluation forms. The third-year form is the single evaluation form for clerkship evaluation. Currently, the revised fourth-year form is being piloted.

Changes in Pedagogy

- Small-group sessions are now incorporated in the biochemistry, Foundations of Human Behavior, Foundations of Human Psychiatry, pathology, and pharmacology courses.
- Case-based discussions are included in biochemistry, Foundations of Human Behavior, medical ethics and palliative care, pathology, and pharmacology.
- The addition of a clinical continuum in the first and second years incorporated preceptorships and patient care activities with primary care providers outside the traditional clinical years.
- Computer-assisted instruction is offered for many first-year courses.

- The second-year palliative medicine course as well as several clerkships have incorporated standardized patient programs for both teaching and evaluation.
- A benchmark evaluation system using standardized patients was piloted in April 2000. Full implementation of benchmark evaluation of all third-year students will begin in the 2000–01 academic year.

Application of Computer Technology

- Students are not required to own computers.
- A 75-station computer lab was completed in 1999, providing access to course-recommended software/programs via on-site and remote access.
- Many courses incorporate computer technology for presentation of modules. Physiology continues the use of computer simulations for teaching.
- All first- and second-year course evaluation is completed on-line. Transitioning of clerkship evaluation to computer systems is under discussion.
- A telemedicine course will be piloted in 2000, incorporating computer technology for teaching and patient care.
- Computer-based testing was implemented in 2000.

Changes in Assessment

- The school is increasing the use of performance-based assessment.
- Standardized patient examinations/OSCE benchmark assessment are being instituted.
- Computer-based testing has been initiated.
- The school is evaluating the need for adaptive educational programs and testing.

Clinical Experiences

- First- and second-year students spend time in primary care physicians' offices as part of the required Clinical Continuum.
- Third-year students spend time in outpatient clinics during pediatrics, psychiatry, and family medicine rotations. Some third-year students also experience outpatient medicine during surgery and obstetrics–gynecology clinics.
- Inpatient and/or operating room experiences are provided in third-year clerkships, including those in internal medicine, pediatrics, surgery, obstetrics–gynecology, psychiatry, and anesthesiology.
- Every fourth-year student is required to complete a subinternship on an inpatient ward in medicine, pediatrics, or family medicine.
- Additional clinical experiences include home visits with a public health nurse (pediatrics) and rural health options (ambulatory medicine).

Curriculum Review Process

- The Curriculum and Evaluation Committee (CEC) is responsible for oversight and review of the curriculum. Each course and clerkship is reviewed annually, using numerous sources of data to identify opportunities for improvement. Course and clerkship directors provide their responses to these reviews.
- The CEC initiated a series of retreats involving key stakeholders in curricular decisions. These retreats focused on identifying year-specific objectives and resulted in work groups to address needed revisions.
- Through the retreats, the CEC recognized the need for more major evaluation and possible revision of the clinical years. The process used (and in use) includes:
    - appointment of an ad-hoc committee, including key stakeholders
    - historical review of the curriculum and experiences of students and faculty over the last 50 years
    - assessment of current curricular offerings in light of previously-agreed-upon objectives
    - identification of guiding principles for curricular reform (see List 1)
    - identification of gaps in student education
    - design and proposal of a revised curriculum, addressing gaps and seeking to improve current offerings with suggestions for revision forwarded to the CEC

LIST 1. Guiding Principles for Reform of the Clinical Curriculum

1. The curriculum should focus on the key knowledge, skills and attitudes needed to care for patients and populations
2. Medicine and medical care should be science-based in the context of the art and humanity of medicine
3. Assessment of learner performance must be linked to learning objectives and should be performance-based
4. Program design should be guided by the principles of effective adult learning
5. The durations of clinical experiences should be based on the time needed to achieve outlined competencies

  - CEC approval with dissemination and distribution of the proposed changes to key stakeholders
  - forwarding of proposal to Faculty Council (and then Executive Committee) for approval
  - continued creation of ad-hoc working groups for design and implementation of components of proposed curricular change
  - collection of evaluation data specific to anticipated outcomes
  - continued discussions with key stakeholders to identify barriers to and opportunities for further improvement
- ◆ Content-specific themes of curricular development have included:
  - longitudinal integration of basic and clinical sciences
  - a multidisciplinary approach to medical care
  - genetics
  - communication
  - managed health care
  - [proposed and under consideration] injury and injury prevention, domestic violence, disabilities, geriatrics, women's health
- ◆ Planning resources needed
  - Curriculum and Evaluation Committee as a whole with organization of tasks by the Executive Committee of the Curriculum and Evaluation Committee
  - Associate deans for curriculum and educational support and evaluation and associated staff
  - Support staff
  - Student leadership as well as "random" students
  - Senior associate dean for academic affairs (as liaison to the dean)
- ◆ Implementation resources needed
  - Course and clerkship directors
  - Educational services professional staff
  - Associate deans for curriculum and educational support and evaluation
  - Central funds for implementation of standardized patient program
  - Central funds to continue support of innovative educational projects (managed through the Learning Resources Committee of the CEC)
  - Access to national experts with financial support for consultation
- ◆ Challenges
  - Assuring that key stakeholders have early input and continued interaction
  - Fear of loss of departmental control/autonomy in curricular decisions
  - Feeling of being "devalued" if time decreased or specialty not included
  - Difficulty in enhancing central authority of the CEC within governance structure
  - Lack of motivation to change (due to other pressures and/or lack of recognition of need to change)
  - Time constraints and pressure on faculty to increase clinical and/or research productivity limiting involvement in educational activities
- ◆ Unanticipated outcomes
  - Creation and piloting of proposed revision to first- and second-year evaluation system, increasing the roles of students and course directors
  - Creation of innovative procedures-focused fourth-year rotation
  - Emphasis on multidisciplinary selectives in the fourth year with many course offerings
  - Increasing basic science faculty's contact with students in the clinical years
  - Formalization of a program focused on professional behavior
- ◆ Plans for evaluation
  - Evaluation of student satisfaction
    - —AAMC Graduation Questionnaire comparisons
    - —Review of student-completed evaluation data by CEC
    - —Long-term post-graduation follow-up survey (5, 10 years)
  - Program evaluation
    - —Course and clerkship evaluations
    - —Formal meetings with course/clerkship directors to review student data
    - —USMLE achievement
    - —Revision of first- and second-year student-evaluation methods for more rapid feedback
    - —Proposed benchmark evaluation (standardized patients) to identify strengths and weaknesses of curriculum
- ◆ There is a formal process in place for ongoing review of education program that includes
  - CEC annual review process now focusing on aligning activities with prioritized goals
  - increased use of data for evidence-based decisions on curricular reform
  - planned presentation of data to align stakeholders with student/school needs

Future Goals and Challenges

- ◆ Preparedness of students for promotion
- ◆ How to incorporate longitudinal curriculum
- ◆ Remediation of students with performance difficulties on benchmarking examinations
- ◆ Appropriate incorporation of technology in educational efforts

University of Wisconsin Medical School

MARK ALBANESE, PHD, AND SUSAN SKOCHELAK, MD, MPH

Curriculum Management and Governance Structure (See Figure 1)

- Under the leadership of the dean of the medical school, three-year strategic plans incorporating educational goals and expectations for outcomes provide the operating framework for the medical curriculum.
- The faculty of the school of medicine constitute the final authority regarding the governance and structure of the medical curriculum and curricular operations.
- As a body of elected representatives of the faculty, the Academic Planning Council (APC) has been accorded the right to represent the faculty in approving matters associated with the medical curriculum.
- The APC has delegated much of the responsibility for curricular review and policy determination to the Educational Policy Committee (EPC).
- The EPC is appointed by the dean of the medical school and is composed of faculty (who generally have had substantial experience in the medical curriculum) and student representatives. The EPC makes recommendations to the APC and advises the associate dean for curriculum regarding educational matters brought to its attention.
- Responsibility for discharging the curriculum is given to course directors.
- Department chairs are held responsible for the effectiveness of operation of courses in the various disciplines.
- The associate dean for curriculum provides curriculum leadership and is held responsible to provide services to support curricular operations and interdisciplinary courses.
- Since its creation in 1995, the position of senior associate dean for academic affairs has provided administrative supervision of the entire educational mission of the medical school.
- During the past decade, the APC was created and became the surrogate for full faculty vote on curricular issues. In addition, interdisciplinary courses were created; these are administered by the associate dean for curriculum.
- Since 1995, when a separate associate dean for curriculum position was created, the EPC has become advisory to the APC and the associate deans for curriculum and academic affairs.
- Curricular management has changed in the following ways:
    - There is now a standard course-evaluation form and administration of course evaluations is centralized.
    - Focus groups are conducted with random samples of students at the conclusion of each semester to identify ways in which the courses and curriculum can be improved.
    - Meetings are held with course directors and the associate dean for curriculum to discuss feedback on course evaluations and from student focus groups.
    - Weekly meetings of the curriculum operations group are held with educational research and policy staff to address operations and policy-implementation issues.
    - Registration and most communications with students have moved to electronic form.

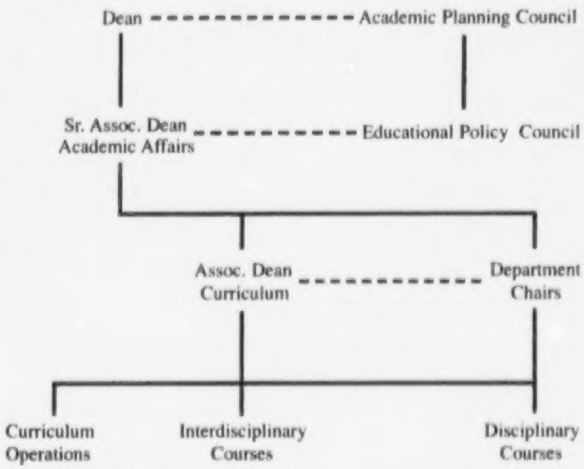

Dean
Academic Planning Council
Sr. Assoc. Dean Academic Affairs
Educational Policy Council
Assoc. Dean Curriculum
Department Chairs
Curriculum Operations
Interdisciplinary Courses
Disciplinary Courses

FIGURE 1: Curriculum Governance Structure

Office of Education

- The Office of Medical Education Research and Development (OMERD) was established in 1972.
- In 1994, a national search was conducted to find a new director of OMERD. The office was reorganized after a review that included both internal self-study and external visitors. In September 1995 it began operation in its new form.

- The reorganized OMERD began with four units: research and evaluation, faculty development, student assessment, and standardized patients.
- The number of staff has increased from four to eight people.
- In 1995, the office began to administer an educational research and development grants program for faculty and staff. It also created a longitudinal database to support institutional research and longitudinal follow-up of graduates.
- In 1995, a new faculty development initiative called the Medical Education Development and Leadership (MEDAL) program, leading to certificates in two areas: basic teaching and educational leadership, was begun.
- In 1999, the unit began to manage a database that records faculty teaching efforts as part of a "mission-aligned management and allocation" process.

Budget to Support Educational Programs

- Beginning in 1998, a mission-aligned management approach was used to establish budgets for the various educational programs of the medical school curriculum.
- Faculty effort over the preceding year was documented to determine base-rate costs.
- In 2000, budgets were allocated to the various units based upon the 1998 figures for faculty effort.
- Specific funds were identified for support of course directors and interdisciplinary courses.
- Most of the educational operations are funded from tuition and monies that come from the state. The UW Medical Foundation provides a yearly allocation that supplements these funds.

Valuing Teaching

- There is a central evaluation system by which all faculty who teach students are evaluated by the students.
- These evaluations are reviewed with the course directors by the curriculum administration and policy staff.
- Each course director selects the teachers in his or her course.
- Recognition for teaching medical students occurs in several ways.
- In departments, yearly salary determinations usually include some type of assessment of teaching contributions.
- Promotion and tenure deliberations require documentation of teaching efforts and student ratings and comments.
- Some departments give their own yearly teaching awards.
- Medical students give teaching awards each year. The dean also provides four teaching awards each year, giving $500 to each recipient.
- The dean's teaching awards are based upon peer nomination, but include consideration of all teaching contributions.
- At the campus and system level, there are numerous teaching awards for which faculty can be nominated. Some of the campus/system awards include a $5,000 cash prize.
- In addition to awards, faculty can apply for educational research and development grants for up to $10,000. The medical school awards $80,000 in educational grants each year.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The faculty have identified a list of 40 outcomes with respect to which students are expected to achieve competency by the end of the third year of medical school.
- Students who fail to demonstrate sufficient competency are required to undergo remediation at their first elective opportunity in the fourth year.
- Beginning in 1996, clerkship directors in the third year of the curriculum were asked to identify up to three critical skills that students should be proficient in before they enter the fourth year.
- These competencies were compiled into a list that is shared with the third-year medical students. Each year the list is updated.
- In June, students are assessed on these skills in a ten-to-12–station OSCE.
- A list of the required outcomes is available from the authors.

Changes in Pedagogy

- In a 1994 curriculum revision, small-group learning experiences were a focal point of the changes that were made.
- Lectures were reduced and small-group learning experiences increased.
- Small-group learning experiences are now central ele-

ments of the Patient, Doctor and Society (PDS) course and the Infection and Immunity course.

- Structured cases are used throughout the curriculum to illustrate application of basic science principles.
- Some material is introduced in the context of clinical cases during small-group instruction and/or lectures.
- Standardized patients are used for both teaching and assessment. Standardized patients have been used for assessment since 1987.
- Standardized patients are used for teaching the female and male GU examinations, interview skills, general and focused physical examination skills, managing sensitive topics, the patient perspective, and cultural awareness skills in the PDS course.
- Standardized patients are used for assessment in OSCEs administered in the PDS course (years one and two), the primary care clerkship (year three), the internal medicine clerkship (year three), and the culminating year-end professional skills assessment at the end of the third year.
- The use of standardized patients in the curriculum has been steadily growing over the past ten years.
- The increasing demand led the school to hire a full-time standardized-patient recruiter/trainer in 1994.

Application of Computer Technology

- Students are encouraged but not required to have computers.
- There is a computer laboratory with computers, and other computers are distributed about the medical school for students' use.
- Administration of the curriculum is almost totally computer-based.
- Students register for classes at a Web site, and messages about changes in course schedules are sent via e-mail to all students affected.
- The school is moving toward Web-based course evaluations.
- Computers are also used fairly widely for instructional purposes. Major courses using computers are physiology (in the laboratory), neurosciences (called Neurochallenge; Web-based software provides student interaction with complex material), pathology, and infection and immunity (computer-based animations help students better understand how microbes attach to cells).
- In the PDS course, computers are used heavily to access literature to support sessions on evidence-based medicine.
- In the clinical years, instructional computing is used to teach the basics of ophthalmology, internal medicine, surgery, and primary care.

Changes in Assessment

- Standardized patients are used to assess students' knowledge and skills in the PDS course twice during the first two years of the curriculum and in the primary care and internal medicine clerkships in the third year.
- At the end of the third year, standardized patients are part of the comprehensive performance exam used to assess students' skill competencies.
- The school served as a pilot site for the NBME clinical assessment center in 1999.
- A process to move the course-evaluation methods to the Web is under way.
- The school is investigating the software needed to administer tests via computers.
- A new building is being constructed in which there will be a testing center where the USMLE examinations can be administered.
- Faculty are assessors for all of the performance examinations.
- Faculty observers rate the clinical skills of students during their clinical experiences.

Clinical Experiences

- Since the 1994 curricular revision, students have been going to physicians' offices beginning the first month of medical school and continuing this until they enter their clinical years at the end of the second year of medical school.
- These clinical experiences are intended to be with the same physician over this two-year period, to provide continuity.
- All students have experiences in both clinics and wards during all four years.
- The school has moved to more ambulatory care experiences for students because of the declining educational value of the inpatient setting.
- Students can elect a host of different experiences, including research.
- Students take study tours abroad on a regular basis.
- Students also rotate to the clinical campuses in other cities, including: Milwaukee, LaCrosse, Marshfield, Appleton, Wausau, and Eau Claire.

Curriculum Review Process

- The themes and goals of the curricular renewal effort are summarized as "less filling, more satisfying." That is, fewer lectures, more small groups, more free time, and increased accountability and professionalism.
- In the 1990s, the EPC first introduced intensive peer review committees (called course review oversight committees), which gave exhaustive reports on the strengths and weaknesses of courses. This review relied heavily on faculty to do intensive course reviews (approximately two FTE per year).
- Information from these reports opened the way to reducing the scheduled time in the curriculum and introducing more clinical experiences. The associate dean negotiated the changes with course directors and department heads.
- The school is now in the midst of reconsidering the curriculum. At the present time, the curriculum is again approaching gridlock.
- The curriculum associate dean will again lead the way to the next revision. It is planned to be a much more participative process.
- The amount of faculty time needed in deliberating the changes is difficult to quantify, but has been and is likely to be in the hundreds of hours, if not thousands. The participation of curricular support personnel in the discussions and planning helped to make the implementation of changes smooth.
- The school was fortunate to have an Interdisciplinary Generalist Curriculum (IGC) grant to provide funding for the support personnel needed. It allowed expansion of the curricular operations staff by one FTE to recruit clinical teaching sites for the preclinical students.

Challenges to Change; Mechanisms for Change

- Animosity of course directors, who gave up time in the curriculum, continues to offer challenges at times.
- The complication of having clinical experiences interspersed among traditional classes has created scheduling problems.
- The clinical experiences have helped the students to have a better appreciation for the basic sciences. The students are now better prepared to enter their clinical years (according to clinical course directors).
- There seems to be greater willingness among the basic scientists to have clinicians lecture in their courses.
- An extensive comprehensive evaluation plan was developed to assess the changes resulting from the 1994 curriculum renewal. (The plan is available from the authors.)
- The EPC, with input from the associate deans and OMERD director, provides a structure for ongoing review of the education program.
- The EPC continually hears requests for new courses in the curriculum and evaluates their merits.
- Reports on the outcomes of the curriculum (USMLE scores, residency placement, responses to surveys of graduates and their supervisors) are presented on a yearly basis to the deans, the faculty, and the EPC.
- Overall, the curricular changes have enabled us to provide clinical experiences beginning in the first month of medical school, expand small-group case-based instruction, reduce lecture time, expand interdisciplinary courses, and introduce a core curriculum in the third year.
- With our ongoing curriculum review we hope to consolidate these gains and increase the flexibility of the third year.

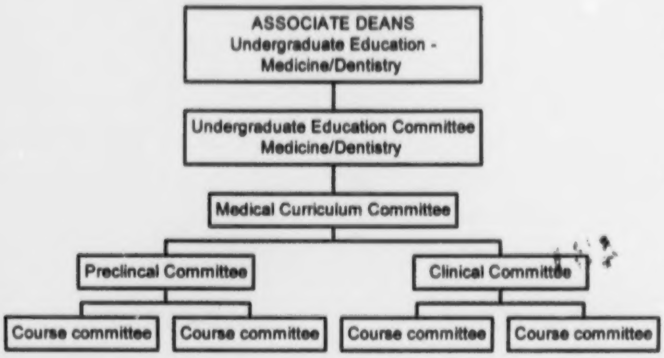
University of Alberta

C. I. Cheeseman, PhD, D. Gupta, and D. Cook, PhD

Curriculum Management and Governance Structure

- The curriculum changed over to a completely new format in 1998, necessitating a revision of the governance structure, particularly for the two preclinical years of the program, which now includes dental students.
- Originally the first year consisted of separate courses in basic science, followed by second- and early-third-year courses devoted to pathophysiology. The clinical rotations were scheduled from late third year to end of fourth year.
- Each course was departmentally or divisionally based and directed by a coordinator selected by the department chair.
- Each phase had an overall director.
- There was some clinical skills teaching in the first two years of the curriculum.
- With the introduction of an integrated first two years, organized primarily around different systems, each sequential course has one or two coordinators supported by a course committee. (See Figure 1.)
- None of these courses is departmentally based.
- In a longitudinal course that runs throughout the year, public health, clinical skills, the function of the health care team, complementary medicine, sexuality, death and dying, substance use disorder, and similar issues are discussed. This course is taught primarily in small groups and makes considerable use of role plays and standardized patients.

FIGURE 1: Organizational Chart


ASSOCIATE DEANS
Undergraduate Education - Medicine/Dentistry
Undergraduate Education Committee Medicine/Dentistry
Medical Curriculum Committee
Preclincal Committee
Clinical Committee
Course committee
Course committee
Course committee
Course committee

- The program for the first two years is directed by a preclinical coordinator, who chairs the preclinical committee, which consists of the course coordinators.
- The clinical years are organized in a similar manner.
- The Undergraduate Education Committee chaired by the associate deans for Undergraduate Medical Education (UGME) and for Dentistry, oversees all the educational programs for medicine and dentistry.

Office of Education

- The Division of Studies in Medical Education was established in 1987.
- The UGME Office led the recent development of the new curriculum and, among its other roles, is currently providing support for faculty development and the writing and scoring of examinations.

Budget to Support Educational Programs

- There is a budget for medical student education that covers the operation of the UGME Office and support for the first two years of the program.
- The budget was developed by the UGME Office and approved by the Faculty Budget Committee.

Valuing Teaching

- Faculty job descriptions, including the teaching role, are defined by the department chairs in consultation with the dean and the faculty members involved, and these are reviewed periodically. Performance is assessed in relation to the job description.
- Undergraduate medical teaching responsibilities are assigned jointly by the UGME Office and the department chairs.
- All teaching performance is assessed anonymously by students, and this information and other relevant material are used at the end-of-year performance appraisal.
- All faculty making application for promotion are re-

quired to provide the Faculty Evaluation Committee with teaching dossiers, using an approved format.

- Students also recognize instructors for their individual teaching performances in both conventional lectures and small groups, through an annual award system.
- Students choose a course of the year for each year of the program.
- The awards are recognized by the faculty at their Spotlight on Achievement ceremony.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Part of the curricular redesign process involved the development of a common set of learning objectives.
- Now that the curriculum is in place, these objectives are being revisited to see whether they are still appropriate and whether there are gaps in the information provided and the topics covered.
- The objectives are not yet faculty-approved and are still in the hands of the course committees.

Changes in Pedagogy

- Each of the new courses now uses small groups as an integral part of the learning process, using either a case-based approach or PBL.
- The number of lectures has been significantly reduced.
- Clinical skills are taught in the first two years using a combination of role-playing and standardized patients.

Application of Computer Technology

- Students are not required to have their own computers.
- The students have access to computers through a faculty-sponsored, university-supported computer laboratory and a recently built separate faculty facility. Informatics is a formal part of the early curriculum.
- The traditional histology teaching using microscopes is being replaced by a series of faculty-developed, interactive, computer-based units.
- Transmission of information to students is done largely through computer usage; e-mail, the Web for course information, schedules, and exam results.

Changes in Assessment

- There have been several major changes in the assessment of students' performances:
  - Each course is now pass/fail rather than having a numerical grade assigned.
  - The pass/fail cutoff point is determined by the Angoff method.
  - The students are provided with much more individual feedback.
  - Performance in the small-group setting is evaluated to assess the ability of the student to function as part of a team.
  - The use of OSCEs has increased.
  - Computer-based assessment is about to become standardized by the Medical Council of Canada, and internal exams will be developed using similar methods.

Clinical Experiences

- Students take a series of mandated core clinical rotations in medicine, surgery, obstetrics, pediatrics, geriatrics, psychiatry, anesthesia, emergency medicine, and family medicine.
- The clinical rotations are primarily hospital-based except for family medicine, which occurs in rural family doctors' offices.
- Each student is assigned to a rural physician and spends four weeks working in the physician's community.
- In the other core areas office experiences vary, but plans are under way to substantially increase this component of the students' education.

Curriculum Review Process

- A new curriculum was implemented two years ago with the goal of reducing lecture-oriented teaching and greatly increasing self-directed learning by the students.
- A curriculum committee was established that then developed a series of theme committees responsible for designing individual new components of the curriculum.
- The curriculum committee established the basic order of the courses and the time allotted to each.
- The course committees put forward proposals for content and teaching methods based on pedagogic principles and on available resources.
- Resources
  - The Division of Studies in Medical Education led the

effort. A new support person was hired to coordinate the committee efforts, about one year into the process.

  - When implementation started, a second individual was also assigned to planning and support. For ease in planning meetings, most were scheduled for noon hours and lunches were provided.
  - New small-group classrooms had to be built to accommodate the new style of teaching.
  - The major challenge was to find the time for faculty to undertake this task at the same time as the delivery of medical services was being reorganized in the health care area.
  - One excellent outcome has been the increased collaboration between basic scientists and clinicians as they team-teach in the new curriculum.
  - The outcomes are being assessed in several ways.
    - —Students' preferred learning styles are measured, using a validated questionnaire, throughout their program, and the results are compared with data collected during the last years of the old curriculum.
    - —There are course-based examinations from the old curriculum, and some questions are used as "marker questions" to assess the learning of key facts.
    - —There are plans to measure performances on the wards to see whether the students are better at integrating clinical concepts and have better clinical skills than students from the old curriculum.
    - —A research project currently in progress seeks to define learning objectives for the clinical clerkships and compare the objectives with student experiences.

- ◆ Curricular development is very much a work in progress. Each course committee, and the Preclinical, Clinical, Medical Curriculum, and Undergraduate Education Committees meet regularly to assess, discuss, and modify the curriculum.
- ◆ There is no formal internal process beyond this, but each year has seen highly significant changes as a result of the inputs of the students and the teaching staff.

University of British Columbia Faculty of Medicine

ANGELA TOWLE, PHD, AND KENNETH BAIMBRIDGE, PHD

Curriculum Management and Governance Structure (See Figure 1)

- The governance structure of the MD undergraduate program (Figure 1) has been reviewed and changed over the past two years to reflect the implementation of a new curriculum introduced in 1997.
- Terms of reference have been developed for all the committees.
- Management of the program is now centrally coordinated by the undergraduate dean's office.
- Clerkships are still departmentally managed.

Office of Education

- Educational support for all the health professions programs at UBC is provided by the Division of Educational Support and Development, located in the Office of the Coordinator of Health Sciences.
- About 80% of the division's work is to support the Faculty of Medicine in the areas of student assessment, program evaluation, Web-site management, and curriculum and faculty development.

Budget to Support Educational Programs

- The school is in the process of defining the budget for the MD undergraduate program.

Valuing Teaching

- During the past three years there has been a major focus on faculty development to support the implementation

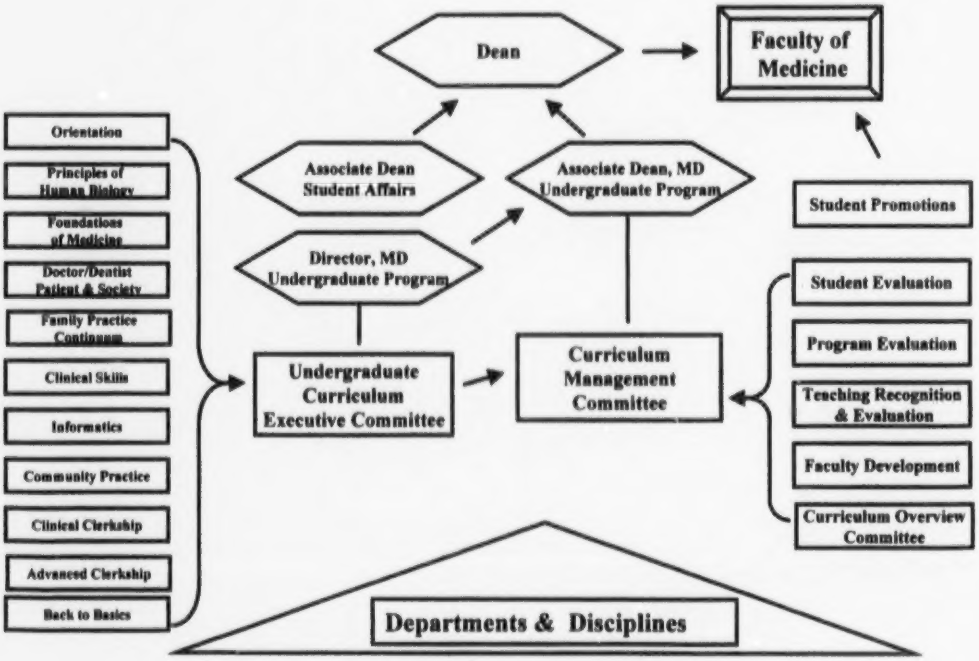

Dean
Faculty of Medicine
Orientation
Principles of Human Biology
Foundations of Medicine
Doctor/Dentist Patient & Society
Family Practice Continuum
Clinical Skills
Informatics
Community Practice
Clinical Clerkship
Advanced Clerkship
Back to Basics
Associate Dean Student Affairs
Associate Dean, MD Undergraduate Program
Director, MD Undergraduate Program
Undergraduate Curriculum Executive Committee
Curriculum Management Committee
Student Promotions
Student Evaluation
Program Evaluation
Teaching Recognition & Evaluation
Faculty Development
Curriculum Overview Committee
Departments & Disciplines

FIGURE 1: Governance of the MD Program

of the new curriculum, with a particular focus on the training and in-service support of PBL tutors.

- Faculty development is coordinated by two half-time directors of faculty development, advised by a faculty development committee.
- The newly formed Teaching Recognition and Evaluation Committee is working on a proposal to develop a special designation for faculty who devote the majority of their time to teaching.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school has a set of defined competencies for medical undergraduates (a copy is available from the first author).

Changes in Pedagogy

- The new MD undergraduate program has a major focus on small-group, self-directed learning, including three PBL tutorials each week for the first two years.
- There is emphasis on early patient contact through three continuity courses: Family Practice; Communication/ Clinical Skills; and Doctor, Patient and Society.

Application of Computer Technology

- Students are required to own computers.
- Curriculum information, such as schedules, lecture notes, images, and other learning resources, as well as learning objectives and weekly quizzes, are provided on a Web site.
- Some assignments and examinations are computer-based.
- Communication with students is largely through electronic mail.
- Computer literacy skills are taught as part of the curriculum.

Curriculum Review Process

- The Program Evaluation Committee is responsible for evaluating the implementation of the new curriculum.
- Each course that has been implemented has been reviewed at least once and modifications made.
- Over the next five years the success of the program will continue to be evaluated against longer-term outcome measures.
- The new MD undergraduate program was introduced in August 1997.
- The final year of the new program will be implemented in 2000–2001.
- The new curriculum was developed as a consequence of recommendations from the 1993 Accreditation Report.
- A strategic planning group set up by the dean developed a blueprint for the new curriculum in November 1994.
- Implementation was led by the Curriculum Implementation Task Force, whose members were course directors and educational and administrative support staff.
- Successful implementation can be attributed to factors such as leadership and support from the dean, the creation of some new administrative and leadership positions, a core of dedicated faculty, a major faculty development initiative, involvement of students in monitoring evaluation and problem solving, and good feedback and feed-forward loops.
- Barriers include variable support from department heads and disaffection of faculty in a few key departments; financial problems in the medical school and a shrinking teaching pool; burnout of the pioneer faculty, limited success in attracting new education leaders to key positions; and ongoing problems with communication in a large faculty.

Future Goals and Challenges

- Major goals to be achieved over the next few years are to create a student-assessment system that better reflects the aims of the curriculum, and to improve the delivery of the curriculum to maximize integration and cumulative learning and minimize redundancies and gaps.

University of Manitoba Faculty of Medicine

OSCAR G. CASIRO, MD, AND CHERYL KRISTJANSON, PHD, ED

Curriculum Management and Governance Structure

- The undergraduate program of the Faculty of Medicine consists of four years of education leading to the Doctorate of Medicine (MD) degree of the University of Manitoba.
- The dean and faculty members, represented by the faculty executive council, are responsible for the design, implementation, and evaluation of the program.
- Policies that govern the program are established by the faculty executive council, while the dean is responsible for the administration of the program.
- The dean acts through the associate dean (undergraduate education) and appoints the faculty curriculum coordinators, who are charged with the task of administering the program.
- The hierarchy of the undergraduate medical program is composed of
  - (at the top) the faculty executive council, the dean of medicine, and the associate dean for undergraduate education
  - the curriculum committee, composed of faculty curriculum coordinators, the chairs of the committees of evaluation, members at large elected by the faculty executive council, and selected students
  - the preclerkship and clerkship committees, composed of the course and clerkship directors
  - teachers of courses and clerkships

Office of Education

- There is no office of education at this time.
- A new position, called Director of Educational Development, was created in August 1999. Currently, this is a three-year contingent position.
- The director envisions the creation of an educational development office that would serve all aspects of the medical faculty regarding curricular, evaluation, and faculty development issues.

Budget to Support Educational Programs

- There is a discrete budget with funds provided by the dean to support the office and administrative expenses in the undergraduate program.
- The director of educational development is funded from the dean's office for start-up funding, and from the continuing medical education department for ongoing supplies and support-staff assistance.

Valuing Teaching

- The vast majority of people involved in the medical education program have other duties such as research and/or clinical practice.
- The Teaching Improvement Program(s) TIPS involves medical faculty members in developing and delivering instructional workshops.
  - The Certification in Higher Education Teaching Program prepares residents and doctoral students for their first academic appointment.
- The workshops are given free of charge to medical faculty, including residents at the University of Manitoba.
- The medical students also recognize outstanding teachers through a teacher-recognition program.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The faculty has developed performance objectives for students encompassing knowledge, skills, and attitudes.
- Students must demonstrate these objectives prior to graduation.

Changes in Pedagogy

- The school was one of the first universities in Canada to utilize small-group learning and tutorials.
- The school has developed a strong problem-solving program that utilizes cases relevant to the areas students are currently studying.

- Communication and clinical skills are introduced early in the student's experience. There is a standardized patient program where students can practice those skills through a variety of activities.

Application of Computer Technology

- There are two computer labs and a new open resource area in the Faculty of Medicine. Together they will house approximately 70 computers.
- Web-based courses are being developed.
- Formative assessments are now available on-line, and there is increased use of the medical school's Web site.

Changes in Assessment

- Evaluation occurs at each level of the curriculum.
- There is a comprehensive exam at the end of each block in the first and second years; a GOSCE is administered at the end of first year, an OSCE is administered at the end of the second year, NBME exams are taken at the end of all major clerkships, and an OSCE is administered in the fourth year.
- Students are also evaluated based on attendance and participation in small-group sessions.
- In the clerkships preceptors evaluate clinical performance.
- Standardized patients are used in the assessment process in the OSCE in the second year and in a comprehensive clinical exam in the fourth year.
- Faculty observation, in-training evaluations, MCQ exams, problem-solving (PBL) exams, OSCEs with standardized patients, practical exams, and exams with mixtures of multiple-choice and short-answer questions are all used in student assessment.

Clinical Experiences

- The Clinical Skills Program begins in the first year.
- Throughout the four years each student is placed, at different times, in the wards of the teaching hospitals, emergency wards, hospital clinics, physicians' offices, homes for the elderly, and rural hospitals.

Curriculum Review Process

- The new director of educational development, in collaboration with the associate dean, has constructed a curriculum evaluation framework to guide curriculum review.
- The purpose of the curriculum review is to conduct an outcome and process evaluation.
- The review is divided into three parts.
    - Part One of the review will consist of two "snapshots" of the medical faculty, one snapshot prior to the curricular change and one current snapshot.
    - The snapshots will include the curriculum content being taught, the number of hours and the methods of instruction, and the primary assessment measures used to evaluate students.
    - This information will be compared with that of other medical schools. This will serve as a reference or comparison point to assist in present and future decision making.
- Part Two involves the identification of a series of performance expectations for students. The performance expectations are the attributes, listed below, that the medical school will impart to its students to prepare them for professional lives. Thus, students must
    - be able to make accurate diagnoses and institute appropriate treatment for patients with common illnesses and some critical illnesses;
    - be able and willing to use scientific principles in evaluating information relating to patients;
    - communicate sensitively and effectively with patients and colleagues—this communication is a two-way street, involving both sending and receiving;
    - be firmly grounded in the ethics of medicine and relate to patients ethically—they must be accountable for their actions and words to patients, colleagues, and society;
    - continue to educate themselves for their entire medical careers (without such activity they will become obsolescent as physicians) and recognize their own strengths and weaknesses and practice within those limitations; and
    - try to understand the society within which they live and, in particular, the health care system within which they work. They must function as responsible members of the system.
- Part Two of the curriculum review will also assess how well the educational program is imparting these performance expectations.
- Questions on the issues below will be posed through surveys, focus groups, and/or interviews to a representative sample of staff and students.
    - Are the performance expectations in line with LCME, CanMeds, and Cleo expectations?
    - Based on your experience teaching the new curricu-

lum, would you make any changes to our current performance expectations? If so, what and why?

- Are the current performance expectations being taught?
- In which block(s) were expectations addressed?
- How are the expectations being taught?
- How are the expectations being assessed?
- How well are students doing in meeting these expectations?
- What evidence exists to support the view that the expectations are or are not being met?

- Part Three of the curriculum evaluation will identify the other factors that affect the success of the new curriculum. The questions below will be posed in survey, focus group, and/or interview form to a representative sample of staff and students.
  - Content
    - —Are there content holes or over-emphases in the curriculum? If so, identify these areas.
    - —Is there an appropriate balance between basic science and clinical content?
    - —Does the content flow in a logical sequence that supports student learning, transference of knowledge, and the clinical skills components?
  - Instruction
    - —Do students receive clear statements about the goals and expectations for each block?
    - —Do students receive information about what the essential learnings are?
    - —Do we utilize teaching strategies that enhance the likelihood that students will learn and/or retain essential learnings?
    - —Do students understand how to transfer knowledge, skills, and ethical values from one block to the next?
  - Evaluation
    - —Do students understand how and when they will be evaluated?
    - —Do we have both formative and summative assessments?
    - —Do our assessment tools fairly assess what we want students' knowledge and skill bases to be?
    - —Do students feel they are being fairly assessed?
    - —Do we have a process for remediation of students' deficiencies?
  - Faculty
    - —Do we value teaching as an integral activity of the medical faculty?
    - —How do we demonstrate that we value teaching?
    - —How do we evaluate teaching performance?
    - —Are the assessment tools for evaluating teaching fair and/or appropriate?
    - —Do we require additional faculty development in the areas of teaching and assessment?
    - —Do we have the right numbers of people teaching in the faculty?
    - —Do we reward good teaching and remediate those who lack certain skills?
  - Outcomes
    - —Is there consistency between the type of student we look for in the admission process and how we develop that student?
    - —Does the undergraduate program adequately prepare the student for postgraduate training?
    - —How are we seen external to our faculty? Are we competitive in the CARMS matches?
    - —What external awards do we receive?
    - —Can students identify excellent performance?
  - Resources
    - —Do we have the necessary resources to continue to implement the curriculum changes? If not, identify what we need and why?
    - —Do we have the human resources to continue to implement the new curriculum changes? If not, what do we need and why?
    - —Are there adequate supports for students? If not, which ones are missing?
  - Governance
    - —Are there appropriate and effective avenues to communicate information about students, curriculum, instruction, and assessment issues within the faculty, university, and country?
    - —Do we have the appropriate committee structures?
    - —Do we have support and leadership from the various deans' offices and the university administration?
  - Outcomes to be tracked include
    - —Results on examinations
    - —Percentage of first matches on the CARMS
    - —Number of external awards
    - —Total faculty hours and commitment of resources
- The results of the curriculum review will be used to
  - provide a clearer picture of where the University of Manitoba stands in relation to other medical faculties in regard to curriculum reform issues
  - provide information about whether the school is meeting the undergraduate performance expectations
  - provide information concerning what factors assist or impede progress
  - provide information that can be used in the Faculty of Medicine to develop a set of principles that directly link teaching with instructor performance
  - provide a framework for future decision making
  - provide data to be used in the accreditation review

  - provide information that can be used to develop curriculum packages and guidebooks
  - provide information that can be used to develop a student-assessment strategy
- Implementation resources have included financial support from the dean's office to conduct this review.
- Part of the money will be used to design conduct and analyze surveys, focus groups, and interviews with faculty and students.
- The results will be distributed to the faculty and students as well as used at a retreat to develop and prioritize strategies to address the issues in the review.
- At this point it is anticipated that the major issues of the review will include
  - support for teaching time in the faculty
  - availability of space, especially for clinical teaching
  - faculty development
  - balance and sequencing of the basic and clinical sciences
  - appropriate assessment
- A review of evaluation methods is currently under way. Some of the changes to be made include
  - improving the OSCE and CCE exam process
  - developing performance rubrics that run on a palm pilot; this will make rating of students in clinical settings easier and more consistent

Memorial University Faculty of Medicine

TOM SCOTT, PHD

CURRICULUM RENEWAL PROCESS

- The year 2000 represents the final year of implementation of the renewed curriculum.
- Changes began with the entering class of 1996.

Learning Outcomes

- The objectives listed below define the program modifications that have occurred in the curriculum.
  - Ensuring that all students complete the core rotations of internal medicine, surgery, pediatrics, psychiatry, obstetrics–gynecology, and rural family medicine before entering into the residency match programs
  - Recalibrating the teaching effort to focus on training to the level of the undifferentiated physician
  - Integrating clinical application into all courses
  - Increasing opportunities for developing skill in critical appraisal of information, and the ability to apply that skill to maintaining a current knowledge of the medical literature and the practice of best-evidence medicine
  - Ensuring that students are adequately prepared to practice medicine with integrity, honesty, and compassion, and maintain high ethical principles in all aspects of their practices
  - Including opportunities for training as collaborators in multiprofessional teams in the provision of optimal patient care, education, and research
  - Improving evaluation at all levels in the curriculum
- The objectives have all been met, to greater and lesser degrees.

Changes in Pedagogy

- By the conclusion of the third year, all students will have completed all core rotations. This ensures that all students will have had some exposure to the broad range of medical practice and its practitioners.
- Some students will have chosen to carry out electives in subspecialties.
- These changes should result in students' making better-informed career choices.
- Attention has been paid to setting the level of instruction at the level of the undifferentiated physician.
- Graduates of the program should be able to practice medicine under supervision, and should be suitably prepared for further specialist training.
- Therapy and patient management have been limited to the final two years of the program.
- Clinical application has been increased in the teaching of basic medical science and the body systems.
- Clinical specialists together with basic scientists do most of the body–systems teaching.
- The clinical significance of the basic sciences is emphasized.
- Training in accessing databases have been added, together with attention to developing critical appraisal skills.
- All students should be able to keep their medical knowledge current through the application of these skills.
- Ethics training has been reviewed and further integrated with training in clinical skills.
- Opportunities for multiprofessional learning have been added.
- In the first year, students work in multidisciplinary groups with nursing, social work, and pharmacy students to consider the health-promotion issues of paper cases.
- In the second year, students again work with nursing, social work, and pharmacy students in PBL tutorials examining HIV/AIDS.

Changes in Assessment

- Attention has been paid to ensuring that exam questions match objectives, that exam question banks have been validated, and that students receive results and exam review in a timely manner.
- Evaluation in the clerkship has been improved with the addition of an OSCE following completion of all core rotations.
- A comprehensive examination has been added.

Curriculum Review Process

- With the implementation of the renewed curriculum, a thorough review will be conducted to validate the new components of the program and identify areas that still need attention.
- Curriculum renewal is a continual process that keeps the faculty and students active and interested in the process of medical education.

Dalhousie University Faculty of Medicine

MICHELINE STE-MARIE, MD, AND KAREN MANN, PHD

A student-centered, problem-based, small-group-learning curriculum was introduced in September 1992. Implementation was very successful, and the next comprehensive review started in 1998 with an in-depth evaluation of the two clerkship years. Several changes were suggested to faculty and implemented in late 1999. At the same time, review of the first two years' units was undertaken to identify necessary changes to promote better horizontal and vertical integration. Changes to the two longitudinal units (patient–doctor/clinical epidemiology, and population health) were implemented in the first year of the curriculum in 1999–00, and their introduction into the second year was scheduled for August 2000.

Curriculum Management and Governance Structure

- ◆ The associate dean's portfolio includes the Undergraduate Medical Education and Student Affairs Division (UMESA), the Learning Resource Center, and the curriculum committees described below.
- ◆ The associate dean chairs the COPS Curriculum Committee and the year committees (e.g., the year one committee, etc.). Progress committees are chaired by chief evaluators.
- ◆ The COPS Curriculum Committee is a faculty committee with membership of non-departmental basic science faculty, clinical and education faculty, and student representatives. It has major responsibilities to
  - develop the overall curriculum, including both content and methods of teaching and learning
  - develop policy regarding the curriculum
  - review the curriculum for integrity and adherence to the curriculum goals
  - evaluate each program
  - assist year committees in their functions, when necessary
- ◆ The year committees (preclinical/clinical) are composed of unit heads of each unit in the curriculum year and student representatives. These committees have responsibilities to
  - discuss issues relating to all units
  - implement the learning experiences most appropriate for the learning objectives of each unit
  - manage implementation issues, with support from the COPS Curriculum Committee, as needed
  - develop and implement student assessment for each unit
  - review students' academic progress
- ◆ The progress committees (preclinical/clinical) are composed of the associate dean of UMESA, the director of admissions, unit heads, and student representatives. Major responsibilities are to
  - review the progress of each student with respect to all evaluations
  - review students' fitness for the study and practice of medicine
  - make recommendations to the faculty
  - review and approve the results of end-of-unit evaluations
  - recommend to the COPS Curriculum Committee matters that relate to evaluation policies of the MD curriculum

CURRICULAR RENEWAL PROCESS

Learning Outcomes

- ◆ The COPS Curriculum Committee thoroughly reviewed the clerkship curriculum in 1998 and proposed a set of learning outcomes that had to be demonstrated by graduating students.
- ◆ The learning outcomes were approved by the faculty in January 1999 and implemented as some of the terminal goals of the clerkship, starting in August 1999.
- ◆ At the end of the clerkship, students should be able to demonstrate attitudes and qualities, and proficiencies in skills and tasks necessary for the development of their future role as medical expert/clinical decision maker through acquiring initial competencies in the roles of scholar, communicator, collaborator, professional, manager, and health advocate.
- ◆ Levels of competency were described in essential roles of graduating students and standards of performance suggested to unit chairs in areas of professionalism, self-assessment skills, humanistic medical care abilities (in clinical ethics and health advocacy), communication and collaboration (including interpersonal skills, communication skills, and team skills), medical expertise (includ-

ing problem-solving, life support, and technical skills), and the intellectual tools and abilities to use basic science in the practice of medicine (including knowledge of the medical sciences; knowledge of pathophysiology; skills in diagnosis, management, and assessment; organization skills, ability to synthesize information, and clinical judgment), and scholarly activity (including critical assessment skills and independent learning skills).

Principles of Ongoing Curriculum Renewal

- Self-directed, lifelong learners
- Student-centered curriculum
- Small-group learning
- Case-oriented problem-stimulated curriculum (COPS)
- Problem-based learning with selective, substantive mastery of foundation knowledge
- Integration of basic, clinical, and social sciences
- Evaluation of student performance based on curriculum goals
- Adaptation of learning to new realities of health care and patients' needs

Timeline for Curricular Change

- September 1992: First COPS class
- May 1996: First class graduation
- January 1999: Revised clerkship approved by faculty and review of patient–doctor units
- August 1999:
  - Start of revised clerkship, phase I
  - Start of revised patient–doctor units
  - Start of revised clinical epidemiology and critical thinking courses in medicine I unit
  - Review of medicine I and II units
  - Increased responsibilities of the Learning Resource Center (LRC)
- April 2000: Appointment of medical director, LRC
- August 2000: Start of clerkship, phase II
- September 2000: Start of revised critical thinking and population health courses in medicine II
- August 2001: Start of revised medicine I and II units

Changes in Pedagogy

- In the clerkship years the following changes have been implemented:
  - Move to ambulatory care settings
  - Move to non-tertiary care settings, including community experiences
  - Move to integrated units:
    —Medicine Principles of Practice
    —Behavioral Medicine and Primary care
    —Women, Children, and Youth
    —Surgical Principles of Practice

FIGURE 1: Curriculum Overview

August	YEAR ONE				May
Orientation **1 week**	**Human Body** **8 weeks**	**Metabolism and Function** **10 weeks**	**Pathology, Immunology and Microbiology** **8 weeks**	**Pharmacology** **5 weeks**	**Genetics, Embryology and Reproduction** **5 weeks**
Elective 76 hours (October - April)					
Patient-Doctor 108 hours (September - May)					
Clinical Epidemiology and Critical Thinking (November - May)					
YEAR TWO					
Brain and Behaviour **10 weeks**	**Skin, Glands and Blood** **9 weeks**	**Respiratory and Cardiovascular** **8 weeks**	**Genitourinary, Gastrointestinal and Musculoskeletal** **9 weeks**		
Elective 76 hours (October - April)					
Patient-Doctor 128 hours (September - May)					
Clinical Epidemiology and Critical Thinking (November - May)					

        - —Electives and remedial unit
        - —Continuing and preventive care, including a mandatory rotation in care of the elderly
    - Introduction of a longitudinal emergency medicine unit
    - Students' objective- and criteria-based assessments of attitudes, skills, and knowledge in each unit
- The Patient–Doctor Units (see Figure 1, top panel) include
    - use of Learning Resource Center Simulated Patients program
    - revision of the human sexuality component
    - increase in communication skills opportunities
    - introduction of interprofessional learning modules
    - simulated-patients workshops in specific areas of the clinical examination
    - use of simulated patients for complete history and clinical examination training integrated with themes of COPS units
    - learning of focused history and examination skills
    - six-week unit on integration of clinical skills at the end of the second year
    - objective and criteria-based assessment of clinical skills
    - skills and procedures modules integrated into other medicine I and II units
- The clinical epidemiology and the critical thinking courses (see Figure 1, bottom panel) foster
    - mastery of learning
    - principles of evidence-based medicine
    - team skills
    - application of population health principles in community skills

Changes in Assessment Methods

- There has been an increase in the use of standardized patients in summative assessment at the end of patient–doctor units and at the end of unit evaluation during clerkship.
- There has been an increased use of COPS cases for communication skills learning and assessment.
- Computers are used in COPS units for testing heart sounds.
- Computers are used in the Licentiate of the Medical Council of Canada (LMCC) examination.
- Computers are used in the development of multimedia applications for the curriculum.
- OSCEs are used in assessment at the end of patient–doctor units and the end of units during clerkship.
- Faculty observation is used to assess students in-training evaluation forms.
- Preceptor tutorial evaluations include faculty observation.
- MCQs are used in the assessment of knowledge at the end of units during the clerkship.

Curriculum Review Process

- Evaluation of changes in the curriculum will be a constant process.
- A variety of measures have been in place since the start of the COPS curriculum, and data on student, preceptor, and program performances are available for comparison with the next cohorts of students who are going through curricular reform starting with the new clerkship in 1999. These measures include
    - student evaluations of introduction to clerkship using standardized forms
    - student evaluations of clerkship experiences using standardized forms and focus groups
    - unit evaluations of clerkship experiences using focus groups
    - student readiness for next clinical experience using questions added to regular rating forms
    - student self-assessments using standardized forms
    - student evaluations of end-of-unit examinations using standardized forms and focus groups
    - assessment of student performances at unit end with MCQ examination and OSCE
    - examination of LMCC performances
    - development of instruments to measure faculty performance

Future Goals

- To increase integration at all levels of the curriculum
- To continue to improve assessment tools
- To centralize assessment functions under the umbrella of a new evaluation committee
- To re-energize the tutorial process and the development and use of cases
- To improve the evaluation of faculty performance and reward faculty for their educational activities related to the curriculum
- To continue the ongoing development of multimedia resources for learning
- To develop distributed learning modules for outside metro clinical settings

McMaster University Undergraduate MD Program

ALAN J. NEVILLE, MD

Curriculum Management and Governance Structure

- The undergraduate MD program is one of several undergraduate health care professional programs within the Faculty of Health Sciences.
- The matrix organizational framework of basic and clinical departments interlinked with educational programs has remained basically unchanged over the past decade, although minor changes affecting the reporting relationship of the education program leaders to the Faculty Council are being introduced in 2000.
- The governance of the undergraduate MD program resides with the Medical Education Committee.
- In the past decade, a number of new working groups of the Medical Education Committee have become established as separate standing committees with clear mandates, faculty chairs, and widespread involvement of student representatives.
- There are student representatives on all committees related to the undergraduate MD program.
- These committees include the Curriculum Committee, the Evaluation Committee, the Student Affairs Committee, and the Protocol Review Committee.
- Admissions, Electives and Curriculum Unit Planning Committees have always existed at McMaster.
- In the past few years, many of these established committees have spawned standing or ad-hoc working groups (for example, the Curriculum Sub Committees for the Population, Behavioural and Biological Perspectives). A Computer-users Advisory Group has also been established in the past two years.

Office of Education

- Support for educational development and research and faculty development is provided to the MD program through the Program for Educational Development and the Program for Faculty Development, respectively.
- Each of these educational resources within the school is currently being expanded in scope so that the individual educational programs can remain innovative and introduce curricular change.

Budget to Support Educational Programs

- The operational budget of the educational program derives from the education services budget from the Faculty of Health Sciences.
- The education services budget receives funds from a variety of sources, including the Provincial Government of Ontario, but much of the educational activity within the school is funded by clinical earnings.

CURRICULUM RENEWAL PROCESS

- The last major review of the curriculum of the medical student education program was carried out in 1983.
- The curriculum is reviewed annually at a Curriculum Retreat and minor modifications have been made since 1983.
- The curriculum is problem-based, and much of the educational activity is carried out in small-group tutorials, which are relatively faculty intense, given the requirement for tutors and clinical skills preceptors.
- New faculty interested in participating in the educational program are encouraged to attend the workshops in problem-based learning and the small-group tutorial run by the Program for Faculty Development, and also to act as co-tutors so that they can be mentored in the tutoring role.
- In 1997, the Curriculum Committee compiled data from a number of exit surveys of graduating students and it reviewed issues that had arisen at Curriculum Committee meetings over the preceding several years.
- These deliberations coincided with the appointment of a new chair of the undergraduate MD program.
- The Curriculum Committee and the Medical Education Committee determined that the pedagogic principles of the undergraduate MD program remained relevant and the principles that governed the educational objectives for the program that had been clearly enunciated in 1983 should continue to drive the curriculum.

Learning Outcomes

- Learners must acquire the knowledge and skills to

  - be lifelong, self-directed learners
  - confront problems and seek solutions
  - work effectively in groups
  - integrate scientific principles into clinical care
  - be effective communicators
  - have a community perspective in addition to a sound biologic understanding
  - be aware of personal qualities as they affect professional behavior
  - self-evaluate and take part in responsible peer evaluation
  - contribute to the solution of health care problems through innovative and fresh approaches
- Over the summer of 1997, the chair of the undergraduate MD program and a subgroup of the curriculum committee developed a number of curricular models or templates that might address the perceived problems with the current curriculum. The problems included the following:
  - At 16 weeks, the introductory unit was felt by both students and faculty to be too long, and it appeared to cover too many topics in a relatively superficial manner.
  - Several of the "content-laden" body-systems units (for example, cardiovascular, renal, and respiratory) required more time to allow students to integrate concepts.
  - Clerkship rotations in pediatrics, obstetrics–gynecology, family medicine, and psychiatry were only four weeks long and felt to be too short.
  - The curriculum calendar was arranged in such a way that students often missed core clerkship time when traveling to interviews for postgraduate training positions.
  - In addition to curriculum renewal, the medical education committee felt that changes were needed in the clinical skills program to enhance integration of professional skills and allow for more direct supervision and evaluation of student learning.
  - The medical education committee felt that many of the changes in evaluation in the undergraduate MD program that had been introduced in the previous five to seven years should be carried forward into the new curriculum without change. These evaluation methods included the personal progress index (PPI), clinical reasoning exercises, and OSCEs.

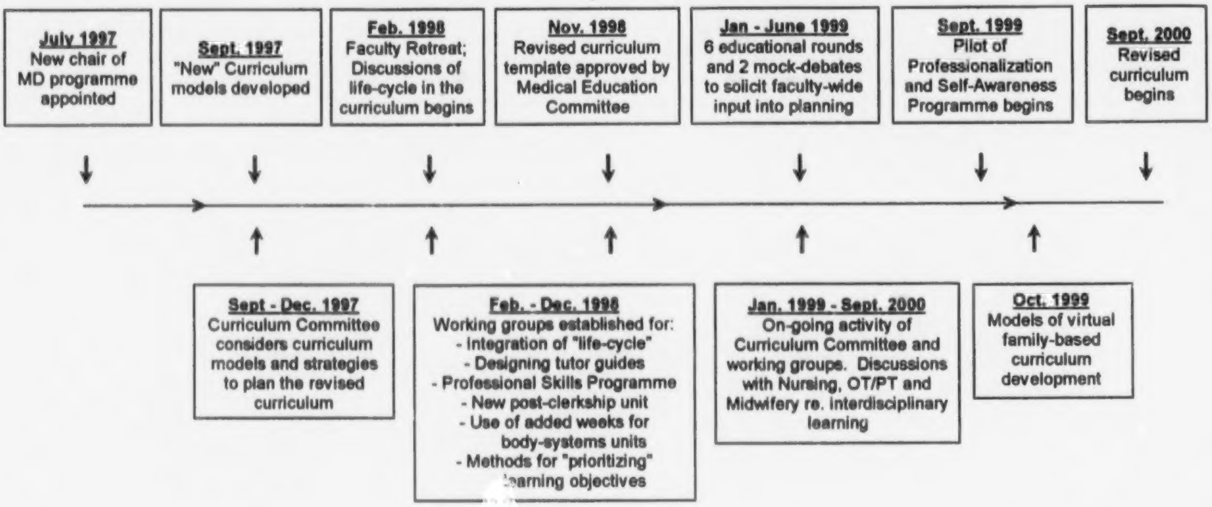
Application of Computer Technology

- Access to faculty resource individuals is increasingly being obtained through the use of an intranet system at McMaster.
- Students make extensive use of electronic database searching, and an "electronic tutorial room" has been established in the school's Health Information Research Unit so that electronic information technology and computer-aided instruction in small-group tutorial learning can be adequately evaluated.

Timeline for Revised Curriculum

- The curriculum committee resolved to introduce the revised curriculum for the undergraduate MD program by September 2000.
- The first of a number of faculty-wide retreats to plan the structure of the new curriculum was held in February 1998 (see Figure 1).
- At the first retreat, the curriculum committee was charged by the school to maintain the small-group tutorial PBL educational method, consider developing more of a life-cycle approach to the body-systems units in the pre-clerkship, and explore innovative ways of utilizing faculty for the didactic sessions that are held throughout the curriculum.
- Specific changes to the curriculum that were approved at this first retreat and directed further development of the new curriculum were as follows:
  - The first curricular block, or unit one, was to be shortened from 16 weeks to 12 weeks and be divided into specific subunits with fewer but more clearly defined learning objectives.
  - The three body-systems units would maintain their three-subunit structure but would incorporate life-cycle learning objectives and would each have one to two extra weeks of curricular time to allow for integration of concepts.
  - The specific life-cycle–oriented unit would be taken out of the curriculum and its content placed both in the pre-clerkship body-systems units and also in the tutorial component of the clerkship, whose curriculum would be more closely allied to the pre-clerkship curriculum.
  - Elective time would remain unchanged, since the faculty felt that the large amount of elective time in the McMaster curriculum was one of its strengths. Changes to the placement of elective time, however, allowed the overall length of the revised clerkship to be eight weeks longer.
- A new curriculum unit post-clerkship was to be established that would allow students to engage in interdisciplinary education with students from the other health science education programs as well as covering curriculum in health economics, pharmacoeconomics, commu-

FIGURE 1: Curriculum Renewal Timeline


July 1997
New chair of MD programme appointed
Sept. 1997
"New" Curriculum models developed
Feb. 1998
Faculty Retreat; Discussions of life-cycle in the curriculum begins
Nov. 1998
Revised curriculum template approved by Medical Education Committee
Jan - June 1999
6 educational rounds and 2 mock-debates to solicit faculty-wide input into planning
Sept. 1999
Pilot of Professionalization and Self-Awareness Programme begins
Sept. 2000
Revised curriculum begins
Sept - Dec. 1997
Curriculum Committee considers curriculum models and strategies to plan the revised curriculum
Feb. - Dec. 1998
Working groups established for:
- Integration of "life-cycle"
- Designing tutor guides
- Professional Skills Programme
- New post-clerkship unit
- Use of added weeks for body-systems units
- Methods for "prioritizing" learning objectives
Jan. 1999 - Sept. 2000
On-going activity of Curriculum Committee and working groups. Discussions with Nursing, OT/PT and Midwifery re. interdisciplinary learning
Oct. 1999
Models of virtual family-based curriculum development

nity health, and the legal and organizational aspects of clinical practice.

Curriculum Renewal Activities, Strategies, and Funding

- ◆ A number of working groups were established to develop specific goals and objectives within the mission of the curriculum renewal.
- ◆ Paradoxically, it has been relatively difficult for some faculty to engage enthusiastically in developing a revised curriculum whose pedagogic construct and overall outline and terminal objectives are not fundamentally different from those in the current curriculum. Despite this, however, the content-change issues described above have been embraced by the faculty.
- ◆ Curricular renewal has stimulated the development of innovative ideas about curriculum delivery in the following areas:
    - Increasing use of an electronic curriculum database will aid curricular planning across the administrative structures of the different curriculum units and allow the Curriculum Committee to integrate the clerkship in the overall three-year curriculum.
    - The Professional Skills Program concept has been developed, encompassing a three-year curriculum in clinical skills to include identifiable curriculum in verbal data gathering (i.e., communication skills, history taking, etc., physical examination, data gathering, and data interpretation and critical appraisal).
    - Revision of the structure of the tutorial health care problem and, in particular, the Tutor Guide so that priority learning objectives will be more clearly identifiable for the tutors.
    - Development of a program of professionalization and self-awareness.
- ◆ Unlike the major curriculum overhaul at McMaster that was undertaken in 1983, the current changes are not being made with the support of any major funding agency.
- ◆ Increased resources have been made available from education services within the faculty of health sciences for a number of retreats for faculty over the two years since planning for the revised curriculum was initiated.

Challenges

- ◆ The two greatest challenges facing the implementation of a new curriculum are
    - ensuring that the curriculum is truly coherent, particularly in the delivery of content related to the disciplines that track horizontally across the three years of the curriculum
    - the development of a comprehensive but deliverable clinical skills curriculum with adequate preparation of faculty to deliver the objectives in the appropriate clinical settings.

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Plans for Evaluation of Change

- Overall curriculum coordination is being managed by the chair of the undergraduate MD program and a subgroup of the curriculum committee, with electronic interfacing between the individual curriculum unit planning groups.
- The success of curriculum integration will be evaluated by curriculum mapping of disciplines across the curriculum, particularly examining the integration of clerkship learning objectives with those developed for the preclerkship.
- Changes to the Professional Skills Program will be evaluated in the annual OSCE exams.
- In addition, the MD program will examine evaluations of students' clinical performances in the clerkships.
- Performances of the students will continue to be assessed on national licensing exams.
- Evaluation of individual curriculum units by the students will continue as is currently undertaken, and close attention will also be paid to the exit survey following curricular change.
- The major challenge for curriculum planners is to create a new and reinvigorated curriculum within a framework that continues to embody the educational principles that have governed this school since its inception. These educational principles are felt to be relevant in the year 2000 and represent the direction in which most other medical schools are heading in the new millennium.

University of Ottawa Faculty of Medicine

LINDA N. PETERSON, PHD

Curriculum Management and Governance Structure (See Figure 1)

- The overall coordination and monitoring of the MD program is the responsibility of the Undergraduate Curriculum Committee (UCC).
- The organization of the new curriculum introduced in 1992 is illustrated in Figure 2.
- The UCC has substantial student representation from the student body association (Aesculapian Society), and student representatives to the two major curriculum committees (Stage I and Stage II Committees).
- There are student representatives on all of the committees that report to the UCC.
- Each curricular component as well as themes that run through the program are represented on the UCC.
- The University of Ottawa is the only bilingual (French and English) university in Canada and has been selected as the National Center for the Education of Health Care Professionals in French in the provinces outside Quebec and Ontario.
- The MD program is currently delivered in both English and French.
- To ensure that there is one program with the same goals and objectives delivered in two languages, the director of the Office of the Francophone Program (Bureau des Affaires Francophone) is a member of the UCC.
- To ensure that clinical skills and disease prevention and health promotion issues are addressed and well integrated in the program, representatives from these committees are members of the UCC.
- The co-chairs of the Evaluation Committee and the director of electives are also members.
- There is also one representative each from the clinical and basic sciences.
- The directors of the library and the computer laboratory (Teaching/Learning Center) as well as the director of faculty development, the assistant dean of admissions, the

FIGURE 1: Governance of the Curriculum

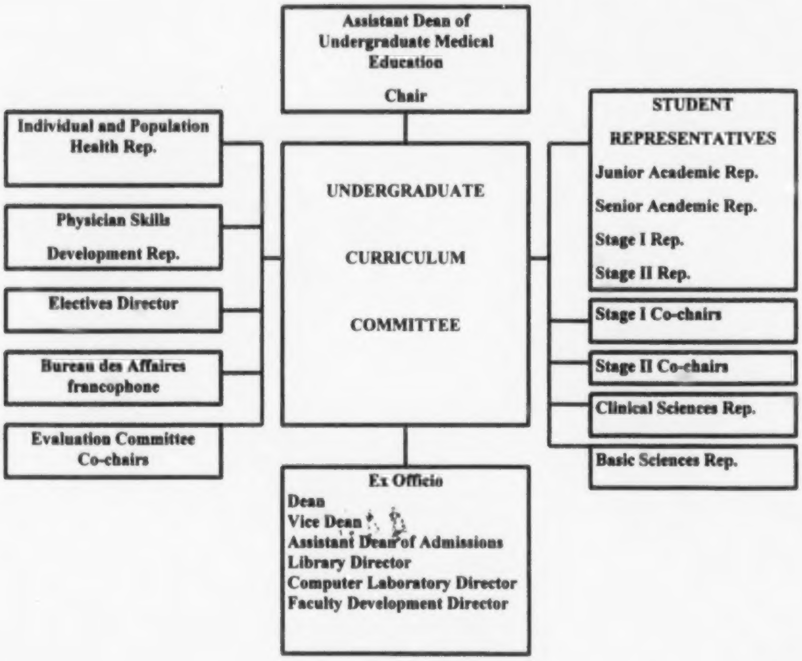

Assistant Dean of Undergraduate Medical Education
Chair
Individual and Population Health Rep.
Physician Skills Development Rep.
Electives Director
Bureau des Affaires francophone
Evaluation Committee Co-chairs
UNDERGRADUATE CURRICULUM COMMITTEE
STUDENT REPRESENTATIVES
Junior Academic Rep.
Senior Academic Rep.
Stage I Rep.
Stage II Rep.
Stage I Co-chairs
Stage II Co-chairs
Clinical Sciences Rep.
Basic Sciences Rep.
Ex Officio
Dean
Vice Dean
Assistant Dean of Admissions
Library Director
Computer Laboratory Director
Faculty Development Director

FIGURE 2: Organization of the New Curriculum

1999-2000
Stage I. Multidisciplinary Blocks

Year 1

Homeostasis & Development 6 Weeks	Hematology & Neoplasia 5 Weeks	Infection & Host Response 6 Weeks	Cardiovascular 6 Weeks	Respiratory 5 Weeks	Renal 6 Weeks
Physician Skills Development Concurrent					

Year 2

Endocrine 5 Weeks	Human Sexuality & Reproduction 5 Weeks	Musculoskeletal 5 Weeks	Nervous System 6 Weeks	Special Senses 3 Weeks	Mind 4 Weeks	Gastrointestinal 6 Weeks
Physican Skills Development Concurrent						

Stage II. Clinical Rotations

Year 3

Link 3 Weeks	Medicine 8 Weeks	Pediatrics 8 Weeks	Obstetrics & Gynecology 8 Weeks	Ambulatory Medicine 8 Weeks	Psychiatry 8 Weeks	Surgery 8 Weeks

Year 4

Electives 10 Weeks	Surgery Selective 4 Weeks	Medicine Selective 4 Weeks	Ambulatory Selective 4 Weeks	Electives 4 Weeks	Back to Basics 4 Weeks

vice dean of education and the dean of the Faculty of Medicine are ex officio members of the committee.

- The composition of the committee ensures that problems/issues are brought to the attention of faculty and students soon after they arise and that there is effective communication regarding proposed changes as the curriculum evolves.
- The committee is chaired by the assistant dean of undergraduate medical education; it meets monthly and members communicate via e-mail frequently, which is the case with all of the UCC subcommittees.
- The committee structure of the UCC can determine whether the program is able to address problems, improve functionality, and introduce new initiatives (e.g., evidence-based medicine, technology-assisted learning, addiction curriculum, CanMeds 2000) as it continues to evolve.
- By consensus of the UCC and the UCC subcommittees, representatives from newly formed committees can have representation on the UCC.
- Proposals regarding curricular change can come from students, faculty, and organizations outside the university (e.g., the Medical Council of Canada, the Ministry of Health, the AAMC, and the ACMC, and community health organizations). For example, the Medical Council of Canada (MCC) has recently incorporated objectives (LEO) on the law, ethics, and the organization of the health care system on the licensing exam.
- In order to ensure the curriculum provides the resources required to allow the students to meet the LEO objectives, a committee is being formed to determine the required contents and propose the level and method of integrating them into the program. This committee will be a subcommittee of the UCC.
- Proposals are approved at the appropriate UCC subcommittee level, then by the UCC, the Faculty Council, the University Senate Subcommittee on Undergraduate Studies, and finally the University Senate.

Office of Education

- In 1992, subsequent to implementation of the first year of the new curriculum that fully integrated clinical and basic sciences into multidisciplinary blocks, it became increasingly clear that responsibility no longer fell under the governance of the traditional basic and clinical departments.

- The Medical Education Office initially consisted of two assistants to the assistant dean of undergraduate medical education and gradually expanded to its present size of six staff persons.
- There is one academic administrator who coordinates the undergraduate education staff.
- There are four academic assistants with responsibility for the blocks in Stage I (both languages), one academic assistant who coordinates the activities in Stage II as well as registering all outside students for electives; and one academic assistant who is responsible for room bookings, faculty and course evaluations, and attestations of credentials for graduates of the MD program.
- In addition to the Stage II coordinator, although not directly funded by the Faculty of Medicine, there are one or two hospital-based coordinators for each rotation who deal with student placements in the core rotations, selectives, and electives.
- There will be one individual funded half-time to assist in the coordination of the Physician Skills Development (PSD) program.
- There is one secretary shared by the assistant dean and the vice dean, who also contributes to the team effort.
- There is another assistant partially funded (75%) in the Department of Epidemiology and Community Medicine to coordinate the Individual and Population Health (IPH) component of the curriculum.
- Plans are under discussion to bring in at least one more academic assistant for Stage II and to coordinate the activities associated with the French-language program, and to obtain a full time coordinator for the PSD course and the link block that precedes the core rotations. This individual will also coordinate the use of standardized patients in clinical teaching.
- The Bureau des Affaires Francophone provides invaluable administrative support for the recruitment and development of French-speaking PBL tutors and teachers, and timely translation of learning materials.

Budget to Support Educational Programs

- Funding for education has come from the Faculty of Medicine to provide the infrastructure of the undergraduate and postgraduate staff (salaries) as well as modest stipends for the undergraduate and postgraduate deans; the admissions deans and the CME and faculty development directors.
- Hardware and software requirements and office supplies are funded from the school budget.
- No discretionary funds were previously available that permitted planning for long-term or short-term initiatives.
- A discrete education budget is to be established this academic year.
- Funds have been identified from increased student tuition fees, and special foreign trainees at the undergraduate and postgraduate level.
- The school, like so many others, relies on individually funded faculty members to provide basic support for a sizable fraction of teaching and its administration.

Valuing Teaching

- The school has a prestigious teaching award, "Excellence in Medical Education," the recipient of which is chosen by the students (in all four years of the program).
- The school is presently establishing other awards for outstanding tutors, preceptors, and innovators in medical education. Work is under way with students regarding the mechanism and type of award.
- There is a plan to have separate awards to identify excellent preceptors from the community who participate in medical education.
- Faculty recognition deserves significant attention if any medical school is to be successful in maintaining enthusiasm for teaching.
- It is critically important that teaching undergraduate medical students be recognized at the level of promotion and tenure.
- The school is considering the identification of separate tracks for faculty whose predominant contribution is in the area of teaching.
- Likewise, it is important to recognize innovations in medical education and research in medical education as valid academic activities worthy of consideration for promotion and tenure.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- A list of learning outcomes for the MD program is available from the authors.
- The outcomes were developed in the mid–late 1980s by a task force of the faculty.

- Perhaps because of the interest of the faculty in going through this critically important exercise, the substantial task of curriculum renewal that followed in the wake of this process was undertaken.
- The Curriculum 2000 committee was established to outline reasons for change and the desired direction of change.
- A task force was created to develop the new curriculum.
- The task force consisted of basic science and clinical faculty from several disciplines who through several faculty-wide retreats came to the decision to dismantle the traditional curriculum and design a new learner-centered education program with problem-based learning and full integration of clinical and basic sciences.
- Task force members outlined what a week in the first two years of the curriculum should resemble.
- An evaluation committee outlined principles of evaluation for PBL and examination format.
- Four large committees were created: The Multidisciplinary Steering Committee (MDSC), which worked on the first two years (biomedical and clinical sciences); the SCRIBS Committee (Structured Clinical Rotations Integrating Basic Sciences); The PSD Committee (for interviewing skills and physical diagnosis); and the IPH Committee (which addresses health promotion, disease prevention, and psychosocial aspects, for example, ethics, legal, epidemiology).
- The MDSC and the SCRIBS Committees were each co-chaired by a clinical scientist and a basic scientist and consisted of members of basic and clinical science disciplines. This was in large part the key to the success of this endeavor.
- The committees identified the learning objectives for each discipline for the level of training.
- After this exercise was completed, the Stage I and Stage II committees were formed to organize the objectives into blocks and determine which learning modalities would be used to achieve their objectives, e.g., PBL, independent learning, laboratory, or case-discussion group.
- The overall organization of the first two years of the program, which ensured integration of PSD and IPH into the blocks, was achieved by an executive committee consisting of the co-chairs of the MDSC (a physiologist and a cardiologist), the chair of PSD (a family physician), and the chair of IPH (a community MD involved in public health).

Changes in Pedagogy

- The traditional curriculum was over 60% lecture-based, the remainder consisting of laboratory teaching.
- Students spent over 29 hours per week in classes.
- There was essentially no small-group teaching.
- In the new curriculum there are 33% fewer scheduled learning activities.
- Students spend five hours per week in PBL, approximately five to seven hours in lecture, two to five hours per week in multidisciplinary laboratory learning, and two to three hours per week in tutorials/workshops.
- All of the learning activities are structured around the PBL of the week. Group sizes are seven to eight students in PBL and about 15–20 in tutorials.
- There was no clinical education in the first years of our old curriculum.
- Students now have patient contact within the first four weeks of the first year in an interviewing skills course.
- Clinical education continues through the first two years of the program.
- An outline of a week in the multidisciplinary block is available from the authors.
- There have been major changes in clinical teaching during the core rotations.
- All core rotations have three hours per week of PBL; most rotations have four to eight lectures per week, some of which are on basic science topics.
- One day per week in the eight-week surgery rotation is devoted to laboratory-based surgical anatomy. This is a prime example of integration of basic science into clinical education.

Application of Computer Technology

- The entering class of 2000 will be required to have PCs with specified performance capability and Web access.
- Plans are to have in place by September 2001 a PC-lease program in which students will pay to lease a fully-loaded laptop that is configured to allow direct and easy access to all curricular material.
- Presently, the education program uses technology in a conservative fashion to enhance or facilitate education.
- All students are given e-mail accounts and are expected to be on-line.
- All communications with students regarding announcements and requests to meet with the staff or the undergraduate dean are transmitted via e-mail.
- The assistant dean maintains rapid communication with students who have academic or other problems and can usually work with the faculty within hours or days to resolve such problems or fill requests.
- The majority of teachers are giving lectures using Power Point and provide copies of the slides electronically to the students.

- A faculty member is developing a Web-based histology resource that has been well received.
- The University of Ottawa is committed to using technology to facilitate learning and to that end established an Office of Technology-assisted Learning and appointed a director.
- Retreats and workshops have been held and others are planned to dialog extensively with students and faculty as how best to utilize technology in learning.
- The most important component in the curriculum is PBL, and plans are to use technology to enhance this experience, not to replace it.
- The plan is to replace many traditional lectures with learning modules and use faculty to hold interactive, problem-solving small-group sessions as the main way of supporting student learning. This will free up the time of our English- and French-speaking professors to become engaged in more interactive teaching as lectures are replaced.
- Each block also has hands-on learning in laboratory settings where gross anatomy and pathology as well as tissue histology and pathology are learned. Plans are to enhance this learning with computers, although some materials may be so well-learned virtually that some microscopy learning may no longer be necessary.
- Presently the faculty and students believe that hands-on learning of morphologic sciences must remain. The laboratories are being wired to bring technology to the site to assist in this process.

Changes in Assessment

- Standardized patients are gradually being introduced into the PSD course.
- Standardized patients are used for the OSCE exams.
- Four of six core rotations have an OSCE component at the end of rotation evaluation.
- Students take a written exam and/or an MCQ exam and receive a mark for PBL, and from their preceptors.
- Two compulsory OSCEs are held in the program, one at the completion of the link block that precedes the start of core rotations. The second one is in February of the fourth year. Both use standardized patients or trained actors. The exam is based on the Part II of the MCC Licensing Exam.
- The school has standardized the evaluation system across the program and has a peer-refereed honors category that is defined as the 80th percentile on objective assessments and meets or exceed performance expectations in PBL (Stage I) or on the clinical preceptor evaluation (Stage II).
- Students merit a Pass with Distinction for a mark of 80% and having also met the same level of achievement in PBL (Stage I) or preceptor (Stage II) evaluation as required for honors.
- Attendance and participation in PBL are mandatory at the school.
- An objective assessment method for PBL evaluation is currently under development.

Clinical Experiences

- Clinical exposure begins in the first month of the first year, usually in a community MD office in the Interviewing Skills Course.
- Most physical diagnosis is learned in the teaching hospitals for the remainder of year two.
- A clinical skills enhancement week has been added to the spring term of second year. This is usually community based and may take place in a rural, underserviced, or northern location.
- The pediatrics, psychiatry, and family medicine component of the ambulatory rotation has four weeks of community-based learning. Students can do this portion in a rural, underserviced, or northern area. There is much interest in outplacements during these rotations.
- Obstetrics–Gynecology has a community component or a primary care component conducted in the hospital setting.
- Medicine has not moved from tertiary care in the core rotation, nor has surgery.
- Students have 14 weeks of elective time in the fourth year that can be spent at any level of medical care in the hospital or community setting.
- The four-week ambulatory selective is exclusively outpatient-based, and students are encouraged to undertake this training in rural, underserviced, or northern locations.

School of Medicine, Faculty of Health Sciences, Queen's University

RICHARD V. BIRTWHISTLE, MD, MSC

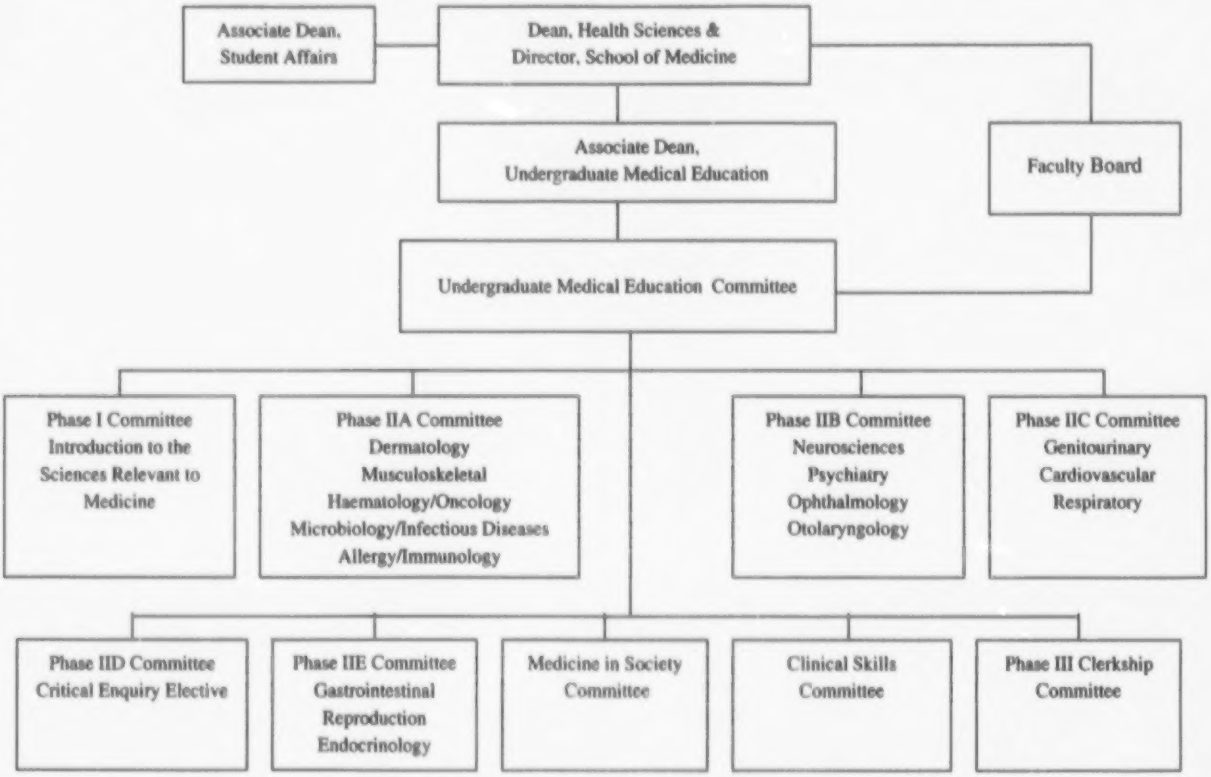
Curriculum Management and Governance Structure

- In 1996, the Faculty of Medicine and Rehabilitation Therapy joined with the Faculty of Nursing to form the Faculty of Health Sciences. Each discipline then became a school within the faculty. The hope is that the new structure will facilitate the development of multi-professional education.
- The Undergraduate Medical Education Committee, a subcommittee of Faculty Board, centrally governs the undergraduate medical curriculum.
- This policy committee is chaired by the associate dean for undergraduate medical education and has representatives from the core system committees, clinical skills, clinical and basic science, information technology, and the student body.
- The associate dean and the systems committees direct the administration of the curriculum (see Figure 1).

Office of Education

- Office of Undergraduate Medical Education coordinates the organization and day-to-day running of the undergraduate curriculum.

FIGURE 1: Undergraduate Medical Education Organizational Chart


Associate Dean, Student Affairs
Dean, Health Sciences & Director, School of Medicine
Associate Dean, Undergraduate Medical Education
Faculty Board
Undergraduate Medical Education Committee
Phase I Committee Introduction to the Sciences Relevant to Medicine
Phase IIA Committee Dermatology Musculoskeletal Haematology/Oncology Microbiology/Infectious Diseases Allergy/Immunology
Phase IIB Committee Neurosciences Psychiatry Ophthalmology Otolaryngology
Phase IIC Committee Genitourinary Cardiovascular Respiratory
Phase IID Committee Critical Enquiry Elective
Phase IIE Committee Gastrointestinal Reproduction Endocrinology
Medicine in Society Committee
Clinical Skills Committee
Phase III Clerkship Committee

- The school is in the process of developing an Office of Medical Education.
- A director, with a PhD in education, has been hired.
- The director's task will be to foster curriculum development in the health sciences and education research.

Budget to Support Educational Programs

- The funding of the faculty in the School of Medicine is unique.
- In 1994, the faculty adopted an Alternate Funding Plan (AFP) for clinical service.
- The AFP (a global "envelope" negotiated with the Ministry of Health of Ontario that provides funds to cover all clinical service) replaced fee-for-service for clinical work.
- The AFP has decreased the dependence on clinical work to fund the educational mission of the faculty and allows for more time for faculty teaching and research.
- There is a budget to support the undergraduate program that primarily pays for support staff in the undergraduate office.
- Also included in the budget are funds to pay stipends to faculty members who have major administrative responsibilities for curriculum.
- Support for teaching or curriculum development or innovation is not part of this budget.

Valuing Teaching

- Faculty members are recognized in a variety of ways for their teaching contributions (apart from the stipends paid to faculty members who have major administrative roles).
- Many departments have financial rewards for teaching as part of an activity-based compensation formula.
- Community preceptors are paid for their teaching contributions, provided with faculty appointments, and given access to library and gym facilities at the university.
- There are a number of teaching excellence awards to recognize superb educators within the faculty. Both students and peers are involved in the selection projcess.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The school had a major curriculum revision starting in 1987, and a new curriculum was implemented in 1991.
- The curriculum focuses on three major curricular objectives: the development of problem-solving skills, knowledge, and professional behavior. Within each framework objective, there are learning outcomes as follows:
    - The major goal of the undergraduate program is the education of students as critical thinkers and problem solvers, skilled in sensing, formulating, and managing common health problems.
    - By so doing, students at graduation will be prepared to expand their competencies either in breadth for careers in family practice, or in depth for careers in particular disciplines, and in either case for continuation of their own education throughout their working lives.
- The essential competencies of students at the time of graduation are in the form of three major instructional objectives of equal importance:
    - Problem-solving skills
    - Knowledge
    - Professional characteristics

Changes in Pedagogy

- With the curriculum reform in 1991, the school moved from a very traditional department-based curriculum to a "hybrid" system-based model.
- The curriculum has undergone several minor revisions since that time.
- The format is a mixture of lecture, small-group sessions, and problem-based learning.
- Basic science and clinical sciences for each system are fully integrated.
- The curriculum has several unique aspects.
- There is an eight-week block at the end of the second year called the Critical Inquiry Elective in which every student must develop and research some scholarly question of interest. This usually involves some data collection and can vary from doing basic bench research to addressing some clinical question. The student must write up the results in a format suitable for publication in a peer-reviewed journal. A number of these have been published.
- One of the most important parts of the curriculum is the clinical skills program.
- The clinical skills program runs out of the Clinical Learning Center that is the setting in which all health science students learn clinical skills.
- Medical students can learn interviewing, communication, and physical examination skills with either patient volunteers or standardized patients specifically recruited to the center for this purpose.
- All rooms are equipped with videocameras so that the

student–patient encounters can be viewed remotely by teachers or reviewed at a later date.

- In the Medicine in Society phase of the curriculum, students have longitudinal courses in medical ethics and law, which use case discussion and small-group interaction as the main methods of learning.
- Evaluation for this component is by written essay.

Application of Computer Technology

- All students are strongly encouraged to have personal computers. A recent survey suggests that about 80% of students have computers at home.
- All course syllabi are mounted on the school's Web site, and several system blocks (e.g., neuroscience) have Web sites where lecture materials, problems, and question-and-answer pages are posted.
- The school's Multimedia Learning Center is currently planning for expansion.
- A course on information literacy is integrated into years one to three.

Clinical Experiences

- Students participate in a wide range of clinical activities.
- Students from week one of medical school see patients at the Clinical Learning Center and in hospitals, clinics, physicians' offices, and chronic care institutions.

Curriculum Review Process

- The faculty reviewed the undergraduate curriculum for LCME accreditation in 1999.
- Prior to that, focused reviews had been undertaken as shown below:
    - Clerkship review, 1995
    - Review of student assessment, 1998
    - Review of clinical skills teaching, 1999
    - Review of basic science, planned
    - Review of "hybrid" curriculum format, planned
- A task group with specific terms of reference does the reviews.
- The task group will include a member external to the faculty.
- A faculty retreat is planned to provide specific input for the planned review.

Process for Ongoing Review of the Educational Program

- Student assessment is changing as a result of the task group report and the accreditation process. The changes are:
    - Increase in the amount of formative testing. This included the development of a new cumulative MCQ examination that students take twice yearly. It tests important knowledge objectives from the beginning to the current point of study. This exam is currently written, but we are planning to develop it as a computer-based examination.
    - Improved remediation for students with academic difficulty.
    - Introduction of logbooks for students to document clinical experiences in clinical skills and clerkship rotations.
    - Yearly OSCE for clinical skills assessment.

Future Goals

- The major issues that the School of Medicine will be addressing in undergraduate education over the next five years will be:
    - increased use of ambulatory environments for clinical education
    - expansion of the involvement of regional health institutions and physicians in medical education
    - increased education of health professionals (medicine, nursing, physio- and occupational therapy) together in appropriate settings
    - development of computer and Web applications in education and assessment

Laval University

JACQUES FRENETTE, MD, AND PIERRE BIGONESSE, MD

Thanks to pioneers in medical education—Gilles Cormier, Jean-Jacques Ferland, Georges Bordage, and Hélène Leclère—the Laval University MD program underwent a major curriculum reform in the seventies and the early eighties. It is now a flexible, mature, renewed MD program.

- In 1982, the school moved from a traditional two-year basic sciences and two-year clinical sciences curriculum to 15 weeks of introduction to the basic sciences in the first semester, 52 weeks of integrated courses by systems and organs, and "transversal" courses, aimed at the integration of biologic concepts and fostering the ethical, psychological, social, and economic aspects of medicine.
- The clerkship is 86 weeks long: 14 mandatory clinical rotations and five electives.
- The program is very flexible. The first 67 weeks can be done in two, two and a half, or three calendar years, permitting each student to plan the duration of his or her program according to background and personnal interests.

Curriculum Management and Governance Structure

- The Faculty of Medicine is responsible for undergraduate programs in medicine, kinesiology, occupational therapy, and physiotherapy, and for granting certificates in human sexuality and in palliative care.
- Each program has a program director and a curriculum committee.
- Each course or rotation is under the responsibility of a course coordinator, who chairs the course committee and reports to the curriculum committee.
- The vice-dean of education's role is to help program directors in their tasks, to promote better teaching methods and evaluation procedures, and to work with the dean's office, other faculties, the university, and other medical schools and organizations.

Office of Education

- In 1975, Laval University created the Office of Health Sciences Education.
- The members were instrumental in the major undergraduate curriculum reform, the creation of a learning center, the reorganization of the family medicine residency program, the establishment of a master's degree program, and the creation of many courses offered to teachers and clinical instructors.
- For the last few years, certain course directors have had the impression that the office was a tool for surveillance and criticism rather than a source of help, advice, and inspiration. This perception may have been accentuated by the "surveillance" role asked of the members of the office by the Faculty of Medicine's administration.
- Confronted with declines in student numbers and professional resources, the Faculty of Graduate Education chose to suspend admissions to the master's program in university pedagogy of health sciences in accordance with the program director's recommendation.
- The school is now involving experienced and interested professors in contributing to the training of new course directors and other teachers.
- There is an evaluation center for health sciences that is doing very well.
- The staff—one full-time professor, two half-time professors, and administrative staff—contribute to evaluation activities (OSCEs, written exams) in the different programs of the Faculty, in addition to being very active nationally and internationally.

Budget to Support Educational Programs

- Faculty are separated into the teaching faculty and the program faculty from the various departments.
- Negotiations for resources take place with the departments.
- The evaluation process is funded with more than $500,000 per year from grants and contracts.

Valuing Teaching

- In the 1970s and early 1980s many clinicians were hired into the tenure track. The majority of them will retire within the next three to seven years.

- In the last ten years, fiscal constraints and a major increase in research funds have limited hiring to researchers and non-MD experts and decreased dramatically the funding for small-group learning (non-tenured) MD course coordinators.

CURRICULUM RENEWAL PROCESS

Learning Objectives

- The objectives of the undergraduate program have been reviewed and were adopted by the faculty council in 1991–92.
- The objectives focus on acquiring general competence, including
    - mastering the knowledge and the reasoning specific to the practice of medicine
    - displaying evidence of scientific rigor and intellectual autonomy
    - being able to communicate effectively and establish harmonious interpersonal relationships
    - considering the ethical dimension of the practice of medicine and respecting the Code of Ethics

Changes in Pedagogy

- During the first 67 weeks the medicine curriculum consists of approximately 700 hours (46%) of lectures, 308 hours (20%) of small- and medium-sized-group discussions, 54 hours (4%) of laboratory work, and 458 hours of individual work: self-instruction modules, and interviews with a seriously ill patient or an elderly person, for example.
- There has been a slight decrease in small-group discussions due to fiscal constraints.
- Cases are used, and patients are interviewed, in large class settings.
- The clerkship is still based on inpatient experiences under the supervision of experienced and devoted clinicians who know well the objectives of the clinical rotations.
- The rotations in family medicine and emergency medicine are ambulatory.
- The opportunities for learning in an ambulatory care setting have increased in surgery and gynecology.
- Some interesting but limited experiences take place in psychiatry and pediatrics.
- It is hoped there will be an increase in ambulatory care settings; however, this is presently limited by the scarcity of rooms, lack of availability of supervisors, and infrequently, fortunately, by the prioritizing of floor work for the clerk.

Application of Computer Technology

- Students are not required to have computers, but almost all of them have access to computers.
- There has been a computer learning center since 1975.
- There is a computer laboratory with 40 PCs, funded in large part by a student investment fund.
- The school is in the process of transferring audiovisual and paper learning modules to CD-ROMs and Web pages, with the help of students.
- Faculty are increasing their use of computer-assisted presentations, and a few have Web pages for their courses.

Changes in Assessment

- Every course has a mid-term evaluation and a terminal evaluation.
- Various types of evaluations are used, the most frequent being multiple-choice questions and short, open-ended questions.
- Other evaluation instruments used include essays, problem-solving sessions, case studies, and observation of students' behavior in small groups.
- At the end of each clerkship rotation, student performance is evaluated by the supervisor, who completes a narrative report and provides individual feedback.
- Supervisors are invited to give a mid-rotation formative evaluation, at least to students who do not perform adequately.
- There are comprehensive simulated-patient OSCEs after eight weeks, after 52 weeks, and at the end of the clerkship. The OSCEs are prepared by the evaluation bureau of the faculty, CESSUL, which evaluates physicians, nurses, midwifes, and lawyers.

Curriculum Review Process

- The program was reviewed by the LCME in May 1999 and was granted a continued full accreditation for a seven-year term in October 1999.
- Between LCME visits, courses are evaluated at least

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every two years and mandatory clerkship rotations every year.

- The contributions of the students to the curriculum committee and the courses committees are excellent.
- Prior to the last LCME visit, the quality of the student analysis of the Faculty of Medicine evaluation report was found exceptional, in the opinion of LCME authorities.
- The visitors qualified the study body as "creative, energetic, accepting the responsibility for its education, supportive, and appreciative of its teachers and its school."
- In April 99, following the self-study, the Curriculum Committee identified these themes for improvement:
    - Increase students' clinical exposure in the first years of the curriculum
    - Improve evaluation of learning; increase formative evaluation and improve quality of final evaluation
    - Plan the contribution of teaching faculty:
        - —Ensure continuity in the transfer of course coordinator duties
        - —Ensure the involvement of other faculty members
        - —Ensure adequate resources and enhance the value of teaching in the undergraduate curriculum
    - Organize pedagogic activities:
        - —Conduct a needs assessment and inventory resources
        - —Implement a pedagogic activities program
        - —Offer the faculty pedagogic consultants' services
    - Increase students' exposures to ambulatory medicine and to primary care during clerkship
    - Ensure greater uniformity of teaching sites (supervision, clinical exposure, evaluation), allowing for local specificities and innovations

Faculty of Medicine, McGill University

J. DONALD BOUDREAU, MD

Curriculum Management and Governance Structure

- A traditional departmentally based governance was used at McGill prior to the implementation of the new curriculum.
- This was changed to a centrally governed curriculum under the direction of the Curriculum Implementation Committee (CIC) and standing faculty Curriculum Committee (CC) in 1994.
- The CIC was dissolved in 1998 once the full curriculum had been implemented, and its responsibilities were transferred to the CC.
- Each curricular unit has a committee that is responsible for the coordination of the unit.
- The chairs of the curricular units constitute a component committee that oversees and maintains horizontal and vertical integration.
- The component committees also provide a forum for discussion of quality control and any issues of common concern.
- The chairs of the unit and component committees report to the CC as indicated in the organizational chart (see Figure 1).

Office of Education

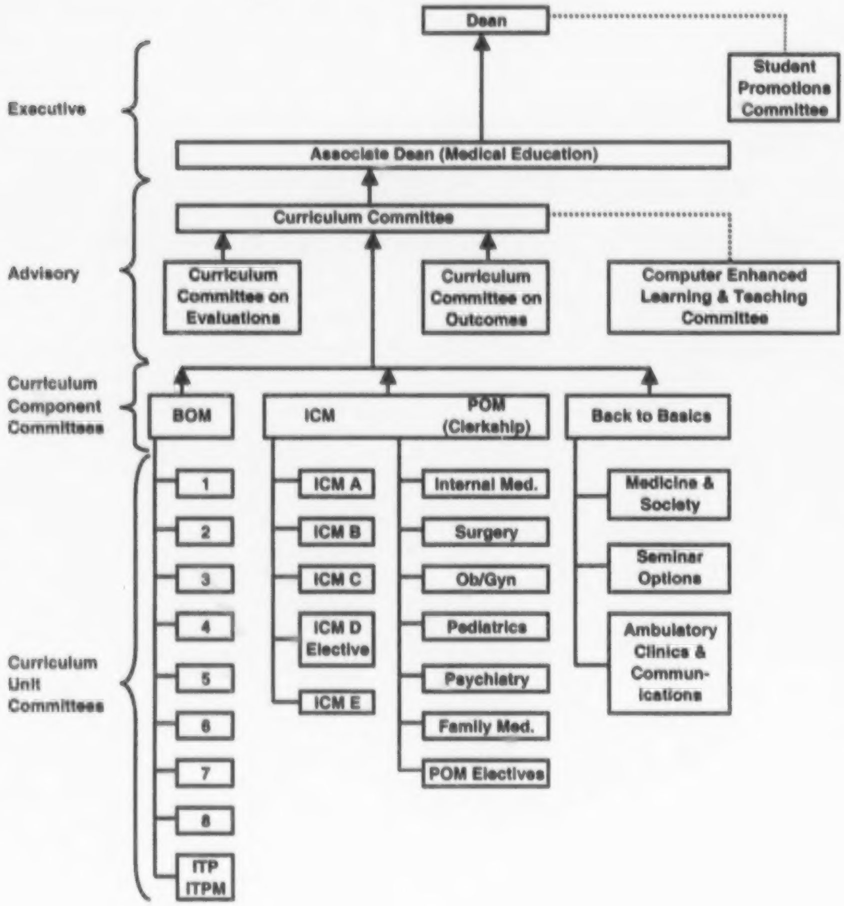
- The McGill Center for Medical Education conducts research on the integration of biomedical and clinical knowledge, the evaluation of small-group interaction in relation to problem-solving skills, and student use of medical informatics.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- The Committee on Curricular Outcomes oversees
    - graduate performances on national examinations (USMLE and Medical Council of Canada)
    - residency match results (CaRMS and NRMP)
    - studies in cognitive research performed by the Center for Medical Education
    - changes in medical student values and attitudes throughout the four-year curriculum (Medical Education Assessment Project administered by Dartmouth College)
    - alumni tracking of practice profiles
    - practice outcomes utilizing provincial databases on prescription claim files and laboratory test requisitions (periodic assessment)
- A comprehensive database including 23 variables is maintained by the Student Records Office.
- These variables are used to correlate various performance measures (e.g., cumulative averages and USMLE scores).
- There was a comprehensive review of the curriculum and all aspects of undergraduate medical education teaching in the period 1991–93. The 1984 report by the Project Panel on the General Professional Education of the Physician (GPEP) and the 1992 presentation by the Commission on Medical Education (of The Robert Wood Johnson Foundation) provided guidelines and a context for this process. The main goals of the process were
    - to shift the teaching venue from the lecture hall to the small-group setting
    - to further emphasize problem solving
    - to augment the integration of the basic and medical sciences
    - to promote and nurture self-directed and lifelong learning
    - to continue to develop the biopsychosocial model in understanding health and illness
    - to respond to and reflect societal changes in health care delivery, such as making increased use of ambulatory care settings.
    - to review and update methods for evaluating performance
- In response to these challenges, a revised curriculum was introduced in 1994.
- The CIC was constituted as a parallel structure to the standing CC.
- The CIC was mandated to apply the guiding principles, as outlined above, using a blueprint. This blueprint included
    - the basic science component would retain a two-phase approach (normal followed by abnormal)
    - the basic science component would follow an organ/system-based approach
    - the clinical experience would continue to have two levels (pre-clerkship followed by clerkship)

Figure 1: Governance Structure


Dean
Student Promotions Committee
Executive
Associate Dean (Medical Education)
Curriculum Committee
Advisory
Curriculum Committee on Evaluations
Curriculum Committee on Outcomes
Computer Enhanced Learning & Teaching Committee
Curriculum Component Committees
BOM
ICM
POM (Clerkship)
Back to Basics
Curriculum Unit Committees
1
2
3
4
5
6
7
8
ITP ITPM
ICM A
ICM B
ICM C
ICM D Elective
ICM E
Internal Med.
Surgery
Ob/Gyn
Pediatrics
Psychiatry
Family Med.
POM Electives
Medicine & Society
Seminar Options
Ambulatory Clinics & Communications

- the curriculum would continue to provide for early patient exposure
- lectures would constitute a maximum of 50% of the total instructional time in each curricular unit
- the units would include small-group sessions, with the goals of providing clinical relevance to basic science material, promoting problem solving, and nurturing collaborative peer exchanges
- the student-evaluation system would accent a multifaceted approach and diminish the weights attributed to grades on final examinations and subjective clinical supervisor assessments

Changes in Pedagogy

◆ The curriculum is comprised of four components:

- Basis of Medicine (BOM) follows a systems-based and integrated approach to normal and abnormal function. It includes a unit that introduces the behavioral sciences and communication skills.
- Introduction to Clinical Medicine (ICM) is a preclerkship clinical experience with rotations in hospital teaching units and ambulatory care settings. It replicates a clerkship experience, albeit with more direct supervision.
- Practice of Medicine (POM) provides for clerkship rotations in six core disciplines as well as electives.
- Back to Basics is the last component; it reinforces concepts in the fundamental sciences as they apply to clinical medicine. It also includes a longitudinal clinic experience and a course called Medicine and Society.

◆ McGill considers the teaching of professionalism to be an essential tenet of its mission.

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- Current activities that promote professionalism include the annual commemorative service for the families of donors (cadaveric dissection program); the Standards of Behavior in the Learning Environment Committee; faculty development workshops on professionalism; lectures on professionalism in the core curriculum; and a small group program in professionalism being developed.

Application of Computer Technology

- The BOM component of the curriculum is now available in electronic format on the Web. It includes over 8,000 pages and approximately 2,000 diagrams.
- The BOM is fully indexed and searchable.
- The incorporation of interactive components such as quizzes is under way.
- Students contribute to this process by developing Web-based instructional modules under faculty supervision and with faculty financial support.
- An Information Literacy course has been introduced; its main objective is to ensure that students have the skills needed to search the electronic medical literature. It is also a prerequisite to a course offered in the ICM component, Critical Appraisal and Informed Medical Practice.
- Computer-based testing and training are being developed and will contribute to evaluation of student performance.
- The program's Web site is: ⟨http://www.med.mcgill.ca/ugme⟩.

Faculty of Medicine, University of Montreal

SERGE DUBÉ, MD, MSC, ANDRÉ FERRON, PHD, AND CLAUDE L. MORIN, MD, MSC

Curriculum Management and Governance Structure (See Figure 1)

- Course and clerkship directors and their respective committees update the curriculum, detailed in a list of required cognitive objectives, every year.
- In addition, the Curriculum Committee conducted a thorough curricular review when the new program was implemented and continues to review the curriculum annually.

Budget to Support Educational Programs

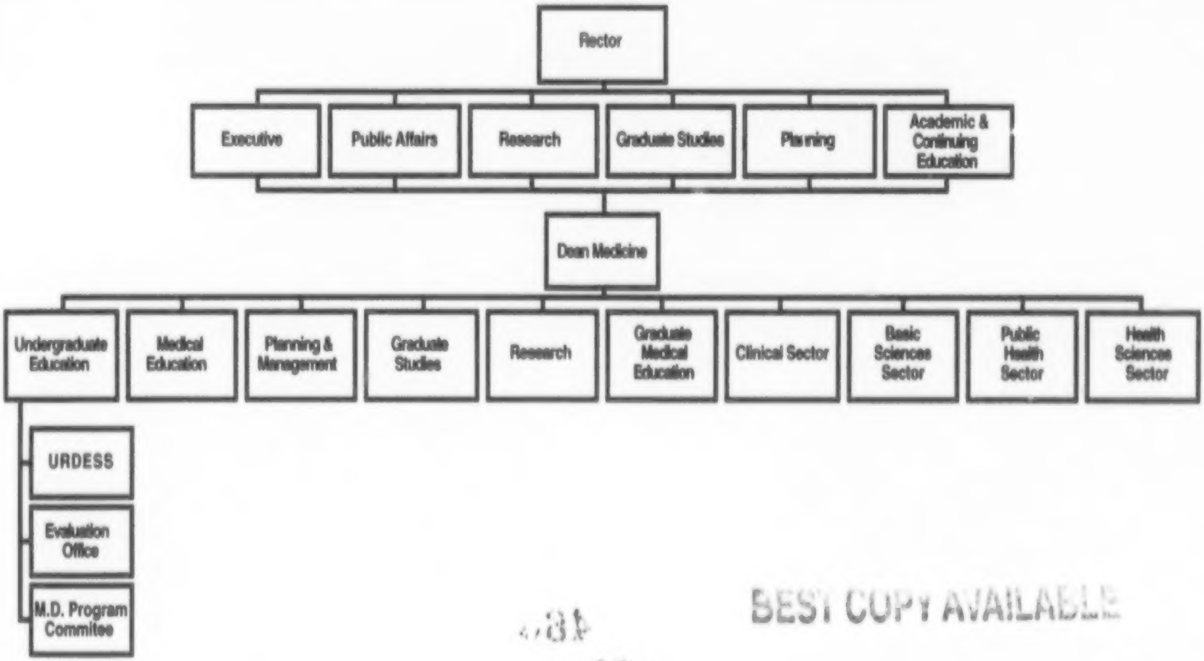
- From 1992–93 to 1998–99, cumulative budget cuts reached $11.4 M, or an approximate reduction of 30% of the faculty's budget.
- Fiscal balance was achieved in 1996–97 ($37.9 M budget).
- The school had a $1.6 M deficit in 1997–98 ($35.1 M budget), which was offset by the university.
- In 1998–99 the school succeeded in convincing the university that it could not attain its mission with a budget of less than $36.5 M.
- Recent discussions held with university administration confirmed that the school would receive the requested budget provided it increased its revenues.
- The school has therefore presented a plan for recruiting new clientele to the university. This project should ensure a budget increase for the faculty in two to three years.
- From 1999–00, the school's budget should remain stable, or even increase.

CURRICULUM RENEWAL PROCESS

Learning Outcomes

- Inspired by the GPEP Report Physicians for the Twenty-first Century, the faculty have adopted as objectives five

FIGURE 1: Curriculum Management and Governance Structure


Rector
Executive
Public Affairs
Research
Graduate Studies
Planning
Academic & Continuing Education
Dean Medicine
Undergraduate Education
Medical Education
Planning & Management
Graduate Studies
Research
Graduate Medical Education
Clinical Sector
Basic Sciences Sector
Public Health Sector
Health Sciences Sector
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basic competences that students should master following their medical studies and throughout their professional lives:
  - The basic clinical management of patient care
  - Application of scientific reasoning and critical appraisal
  - Communication and teamwork skills
  - Behaviors and attitudes appropriate to the practice of medicine
  - Ability to carry out independent learning and updating
- The curriculum before renewal had the following characteristics:
  - Pedagogy based on behavioral approach
  - First-year enrollment: 170 students
  - Basic sciences taught by basic science faculty only (lectures)
  - No attempt to integrate content of clinical sciences determined by individual departments and no attempt to coordinate teaching programs across disciplines
  - Humanities were taught through behavioral sciences courses
  - Most preclinical and clinical courses were lecture-based
  - Clinical teaching was inpatient-oriented
- The new curriculum has the following characteristics:
  - Pedagogy based on the cognitive approach
  - First-year enrollment: 138 students
  - Basic sciences are taught by PBL approach and tutors are divided among basic science faculty (20%), clinicians (80%), (specialists, 80%, general practitioners, 20%); major efforts have been made to improve coordination and integration
  - Clinical departments have made some efforts to adjust the contents of their teaching to be in line with basic population needs, but they still need improvement in coordination and integration
  - A doctoring course has been set to develop the professionalism and competency of preclinical students
  - Most preclinical and clinical courses use PBL and focus on teaching clinical reasoning.
  - Clinical teaching is a balance between ambulatory and inpatient education (50%–50%) and sufficiency of experiences in primary and specialty care

Curriculum Renewal Timeline

- GPEP Report 1987
- Faculty Council meets December 1990, decision to undertake a complex and extensive process of curricular revision
- Task force for giving the new program its general orientation
  - June 1991—publication of "Livre vert"
- September 1991–1993: new Curriculum Committee
  - Curricular development and planning meetings—pedagogic training
  - Support to faculty and students
  - New program September 1993
  - Full implementation
- 1993–1999: Through the Curriculum Committee
  - Each course was evaluated and modified by the input of faculty and students
  - Basic sciences departments made special efforts to integrate the content of their teaching
- April 1998: self-study report
- April 1999: AAMC Evaluation
- October 1999: Seven-year accreditation

Changes in Pedagogy

- The content of the curriculum and the learning activities are focused on teaching the objectives.
- The program includes both basic sciences and clinical sciences.
- Efforts are made to focus on the required curriculum on specific target groups, the pediatric/adult/geriatric population, the male/female population, the multiethnic population, in order to make the curriculum representative of various aspects of medical practice and sensitive to the needs of our society.
- The PBL method is used in two thirds of the learning activities for courses given on campus. This method allows students to develop teamwork and independent-learning abilities.
- In the first year of the program, students are already involved in clinical learning activities in hospitals one day a week, giving them an early exposure to clinical environments, teachers, and multidisciplinary hospital teams.
- The program offers students a wide range of courses and optional clerkships outside the Quebec urban areas and academic centers and abroad, affording them the opportunity to explore new fields.
- Because students with different backgrounds are admitted, the admission policy promotes the development of an all-round education rather than a strictly scientific one.
- All branches of medicine, i.e., family or specialized medicine, community medicine, research or university careers, are available to students.
- The program also provides the opportunities to do Master's or PhD work in other fields while completing the medical curriculum.

- Students must reconcile their choices of careers with hospital and university needs, since the numbers of family physicians and medical specialists are controlled by the government, limiting the areas and the fields of practice.

Changes in Assessment

- During the two preclinical years, for every PBL-based course, 20% of the final score is the result of the evaluation by the tutor of the student's involvement, behavior, and attitude, and 80% is the evaluation of the students' knowledge, usually assessed through a mid-session and a final exam that are mostly made up of SAQs, SEQs and MCQs.
- So far as the Introduction to Clinical Medicine (ICM) courses are concerned, the evaluation is based on various methods (logbook record, case histories, making a video of a clinical exam, behavior during patient tours, personal assignment on an ethical question, mini-tests made up of SAQ questions related to directed readings) that account for 40% to 50% of the final score.
- At the end of each term, the evaluation is completed by an OSCE of ten stations for the first three terms and an OSCE of 16 stations for the last term in view of the final ICM exam, which covers the knowledge acquired over the two preclinical years.
- Students must answer a series of SAQ questions that represent 20% of the final score, in comparison with 80% in the case of the OSCE.
- The clerkship-sanctioning evaluation consists of an evaluation of the student's clinical behavior and abilities that accounts for 40% to 80% of the overall score depending on the clerkship, and of a final exam (20% to 60%).
- The exam includes OSCE stations in surgery, pediatrics, medicine, obstetrics–gynecology and radiology that account for 25% to 55% of the overall score.
- Varying numbers of problem-solving and clinical decision-making questions (Medical Council of Canada Q4 test) and of multiple-choice questions are also used, depending on the clerkship.
- For every written exam, an acceptable performance level (APL) is determined, using the Ebel scale.

Curriculum Review Process

- The vice dean, the coordinators, the course and clerkship directors, and the Evaluation Office analyze the exam and evaluation results, which are also forwarded to the Curriculum Committee.
- Assessing student performance is based mainly on in-house exam results.
- The only outside indicator currently available is the Medical Council of Canada (MCC) licensing exam results.
- For 1997 and 1998, the first two groups of graduates who completed the new MD program ranked third in Canada. For 1994, 1995, and 1996 (old program), the Faculty of Medicine students from the Université de Montréal ranked first at the Medical Council of Canada exam (Part I). The first group of the new program (1997) ranked first for the part II of the MCC exam. We used to rank sixth to eighth in the old program.
- An examination of the results of the in-house exams of the clerkship I and II and the results of the MCC exam shows a strong correlation, with coefficients of .30 to .51 for the 1997 graduates and of .25 to .50 for the 1998 graduates, and a full accreditation from the LCME in 1999.
- The strengths and weaknesses identified during the LCME visit are summarized here:
  - Strengths
    - The Faculty of Medicine at the Université de Montréal, under the leadership of the dean, is one of Canada's most prestigious faculties of medicine
    - A strong, dynamic Curriculum Committee, with an enthusiastic chair, supported by URDESS and the Bureau d'évaluation
    - A highly motivated, talented student body that is substantively involved in the curriculum
    - A creative and well-monitored curriculum in which the subject matter is well covered, with no significant gaps
    - Ongoing improvement of integration of basic and clinical sciences in the undergraduate medical curriculum
    - A well designed ICM/IDC program that highlights the early introduction of clinical material and principles of clinical medicine
    - A broad base of excellent and dynamic clinical teachers who are widely respected by students
    - The protection of the undergraduate curriculum budget in the face of severe across-the-board budget cuts in the school
    - A firm commitment to facilitating the learning of computer-based knowledge and evidence-based medicine
  - Weaknesses
    - Very significant budget compressions that have hit the faculty/university and the hospital sector simultaneously
    - As in 1992, communication is problematic; this appears to be the case between the administration and departments, especially regarding financial

planning and accountability—it also exists between departments and faculty

—Clinical professors, who are carrying out most of the teaching responsibilities, feel vulnerable because of the lack of formal long-term career and financial security that recognizes and values academic contributions

—There needs to be recognition of faculty members' contributions to undergraduate teaching through promotion and benefits

—The development of plans to pool practice and other revenues to support the academic mission continues to be extraordinarily difficult to implement; it is essential that a fresh analysis of the situation be undertaken and that efforts in this direction be negotiated

—The condition of student amenities, including the library, is deplorable

Future Goals

- Despite the recent full accreditation, new problems emerge that need to be addressed.
- Because of government legislation an increase of 50 new students (over the next two years) will put a burden on faculty.
- Ambulatory services are on the rise, and new methods of teaching preclinical students will need innovations.
- Pressures on clinical faculty for clinical productivity may prevent them from performing their teaching tasks.
- Changes in society's needs and contingencies force a curriculum to adapt more and more rapidly.

Sherbrooke University Medical School

André Plante, MD

Curriculum Management and Governance Structure

- In 1987, after a grand reform of the educational program, the school instituted an organ-system–structured PBL preclinical curriculum. The ongoing evolution of medical education and fundamental change in health care led the school, at the end of the 1990s, after more than ten years of experience, to "reform the reform."
- A curriculum committee is in place that is chaired by the vice dean for undergraduate education.
- The committee is composed of student representatives from each cohort, resource and content expertise (heads of clinical departments), specific pedagogic input (consultant in education), the faculty development program director, members of the coordinating committee, and ad-hoc heads of specifically appointed subcommittees.
- The committee's function is to present and discuss all major changes in the content of the teaching and learning process and to assure ongoing evaluation of the curriculum in order to reflect upon and plan future changes.
- A coordinating committee deals with the everyday implementation of curricular policy.
- The coordinating committee is composed of the coordinators of the five undergraduate sectors (basic sciences, PBL, clinical skills, clinical integration, and clinical clerkship), the chair of the evaluation committee, and the chief faculty secretariat administrator, and is chaired by the vice dean for undergraduate education.
- The coordinating committee meets bimonthly and monitors curricular activities as well as trouble-shooting day-to-day problems in the undergraduate program.

Office of Education

- The Office of Medical Education has been in place for more than two decades.
- The undergraduate program and the education office share a common conceptual framework of *what* to teach (medical expertise), *how* to teach (contextual learning with teachers as facilitators), and *how* students learn (the cognitive psychology of information processing for learning).
- Since 1997, the office has worked very closely with the undergraduate program to implement faculty training and support congruent with the pedagogic methods used by the faculty.
- PBL tutors are obliged to attend yearly full-day courses adapted to keep pace with changes suggested by internal and external curricular monitoring. More than 80% of teachers have participated.
- Other major faculty development programs currently being presented by the education office include training in clinical coaching and clinical-reasoning sessions as a continuing part of the reform in the clinical clerkship.

Budget to Support Educational Programs

- Funding of all medical education in Quebec comes from the provincial government and from student tuition fees.
- A highly sophisticated local system integrating clinical practice plan funds assures that appropriate remuneration is directed towards those who are actively involved in teaching activities and educational development.
- Teachers and educators thus have some direct reward for their efforts.

Valuing Teaching

- Undergraduate teaching is one of the fundamental pillars of our medical school and this is made clear in staff recruitment.
- Clearly much depends on individual motivation and interest, but heads of department also suggest or delegate where appropriate.
- Teaching activities also figure prominently in assessment for faculty promotion.
- Individual teaching competence is assessed through PBL-unit monitoring, and annual faculty development is obligatory before the beginning of each teaching unit.

CURRICULUM RENEWAL PROCESS

Learning Objectives

- General learning objectives have been in place since the implementation of the PBL curriculum in 1987.

- Terminal medical competencies, largely related to those defined by the Medical Council of Canada, are defined in relation to each clinical clerkship and for the clerkship overall.
- The school is in the process of emphasizing humanistic and community-oriented components of the curriculum.
- Terminal medical competencies for each PBL unit are currently being identified, with the aim of integrating clinical skills and clinical reasoning with the new knowledge acquired in the units in addition to the integration of public health concepts and professional values.

Changes in Pedagogy

- Ten years into a wall-to-wall PBL curriculum, during which time our students continued to perform well at the national level, formal and informal assessments revealed the need for overhaul.
- Lack of communication across curricular components, relative weaknesses in isolated knowledge domains, declining motivation of students, teachers, and management, and lack of teacher standardization led us to decide to "reform the reform" of our undergraduate program.
- Following much internal review and reflection based on the educational literature, it was decided to propose an integrated conceptual framework based on three different recognized theories from the medical literature.
    - The first refers to the longitudinal acquisition of medical expertise from the novice who enters medical school to the expert clinician of later years. This theory suggests that there is a need to design a different, more efficient way of acquiring knowledge, skills, attitudes, and habits of mind. For this reason, the aim is to blend learning objectives into terminal competencies integrating all of these concepts.
    - The second refers to the learning process itself and how students learn.
        - —To facilitate the reactivation of prior knowledge, the learning objectives were mapped for the entire curriculum and made available to students and teachers.
        - —In order to foster better organization of knowledge in memory, the students are required to provide concept mapping of knowledge learned after individual study of each PBL problem.
        - —A program had been implemented to help students study more effectively by helping them develop better learning and motivational strategies.
    - The third theory concerns contextualized teaching and learning.
        - —In order to restore to teachers their importance in the teaching process, we have evolved from the passive tutor to one who is much more active.
        - —Tutors are encouraged to contextualize the learning objectives by appropriate clinical examples and this is reflected in students' end-of-unit assessments of tutors' ability to transfer knowledge.
- Faculty development programs have been implemented to educate teachers in aiding students to transfer theoretical to practical knowledge, in giving constructive feedback on concept maps, and in reading and learning strategies. Thus the teacher can pass on to the apprentice the benefit of his or her acquired medical expertise.
- Enormous time and effort has been invested in the reform of pedagogic methods across the spectrum of the curriculum, from the technical aspects of the PBL tutorial to the broad application of teaching philosophy and current education theory.
- A major project is under way that will serve to export and implement this conceptual framework to undergraduate clinical teaching, postgraduate training, and continuing medical education.

Application of Computer Technology

- Although students are not required to own computers, many do, and all have access via the medical school library
- All educational objectives have been collated into a database available to students and faculty through an intranet.
- Pilot projects are in place in some PBL units using Internet links with hypertext features, etc., to access validated resources and materials.

Clinical Experiences

- The students have a three-week clinical exposure in the first trimester.
- Clinical skills learning sessions in parallel and related to PBL units begin in the second half of the first year and continue to the final-year clerkship.
- There is a two-week clinical community experience in the latter part of the second year.
- The clinical clerkship is preceded by a trimester of clinical integration and preparation.
- The clinical clerkship takes place over a period of 15 months of obligatory and optional clerkships, primarily in hospitals (wards, OR, and clinics), but also in primary care clinics.

- The goal is to expand the community clinical exposure of the undergraduate program.

Curriculum Review Process

- The themes and goals of curricular reform have been defined in relation to the pedagogic methods used.
- To achieve the ultimate goal of the acquisition of medical expertise, the plan is to standardize the skills of the teachers through very active faculty development. This provides a coherent and common approach across the spectrum of clinical specialties and basic sciences.
- The results of systematic curricular monitoring, including formal student evaluations of teaching units, learning objectives, teachers, and modes of evaluation, are collated and analyzed for presentation and discussion at coordination and curriculum committee meetings.
- Subsequent changes in policy or practice distills from these discussions and the education office designs and implements faculty training in order to complete the reforms.
- Program coordinators produce annual lists of objectives and reports that are discussed with the vice dean and presented to the coordination and curriculum committees.
- Subcommittees are created to address specific needs and priorities.
- Practical decisions for implementation are taken thereafter.
- The decisions of the curriculum committee are overseen by the faculty council, chaired by the dean of the medical school.

Changes in Assessment

- Standardized patients and OSCEs are used throughout the curriculum.
- Faculty development in the sphere of clinical coaching is putting much emphasis on the importance of direct observation of the student performing history taking and clinical examinations.
- In terms of traditional evaluation methods, the students' performances on the national licensing examination have been outstanding.
- Competencies are more difficult to evaluate than knowledge, and we are exploring modes of evaluation based on global performance as part of our program of terminal, integrated end-of-unit competencies.
- The development of a comprehensive structured oral clinical examination is one of the current priorities.

Future Goals

- Immediate challenges are the implementation of end-of-unit competencies as well as a trans-unit curriculum in public health.
- The efficient use of computers across the curricular spectrum is under discussion, and faculty development will soon be in place.
- Other considerations include reform of the admission process, the effects of the feminization of medicine, apparent devaluation of professional values, and the implantation of legal, ethical, and caring issues.
- Finally, budgetary constraints imposed on the universities are putting a heavy strain on the various components of medical education; maintaining and improving standards of excellence in medical education in the face of such pressures remain the perennial challenge.

Appendix

GLOSSARY

Definitions and Explanations of Selected Terms Used in This *Snapshot* Supplement

The **AAMC Graduation Questionnaire** (GQ) is an annual survey of graduating medical students that has been administered by the Association of American Medical Colleges (AAMC) since 1978. The 2000 GQ consisted of 40 questions (250 items) that covered a wide variety of topics, including student demographics, education experiences, student abuse, and student indebtedness. For more information, see the GQ website at ⟨http://www.aamc.org/meded/gq⟩.

The **AAMC Matriculant Questionnaire** (MSQ) is an annual survey of matriculating medical students that has been administered by the Association of American Medical Colleges (AAMC) since 1987. The MSQ queries new medical students about topics such as background characteristics, educational experiences, and personal beliefs.

Active learning is a term used to describe educational methods (such as small-group discussions, tutorials, and laboratory exercises) that require students to be active participants in the learning process. These methods contrast with lecture formats, where someone is speaking *to* the students.

AHEC stands for Area Health Education Center. These federally funded centers create collaborative community-based education and training experiences for health professionals, health professions students, and primary care residents through educational linkages between academic health science centers and the communities they serve.

Ambulatory clinic. (*See*: ambulatory setting.)

Ambulatory setting is any venue where medical care is provided to patients who are not admitted to a hospital for an overnight stay. (*See also*: outpatients.)

Basic science is a term given to curriculum content that is not specific to the clinical disciplines of medicine or medical practice. The basic science course work is taught, typically, in the first two years of medical school. The individual disciplines, such as anatomy and cell biology, that contribute to the basic science content are referred to as "the sciences basic to medicine."

Biopsychosocial model describes medical care that explicitly recognizes the psychological, social, and cultural dimensions of a patient's illness.

Block-style curriculum is a way of organizing the curriculum in which students are introduced to the basic science principles that apply to a particular organ system on a system-by-system basis, rather than being presented with a series of individual basic science courses.

Case-based teaching refers to a teaching method that uses a patient case (actual or created) to stimulate discussion, questioning, and problem solving and reasoning about issues pertaining to the basic sciences and clinical disciplines.

CBX is the acronym for computer-based examination.

Clerkships are educational experiences of four to 12 weeks' duration that give students concentrated periods of exposure to patients in inpatient or ambulatory settings. The focus of learning is on the clinical manifestations, diagnosis, and management of diseases specific to a clinical discipline (e.g., internal medicine or pediatrics).

Community-based experiences refer to educational experiences for students that generally take place in the offices of physicians who are practicing full-time in the community (as opposed to being on the faculty of the medical school). Some community-based experiences occur in other venues such as homeless shelters, domestic violence shelters, prisons, and community clinics.

Contact hours refer to the number of hours in the curriculum when students are in contact with teaching faculty and that can be quantified (e.g., hours in lectures, seminars, or clinical rounds).

Continuing medical education (CME) refers to the educational activities that practicing physicians engage in to advance their knowledge and skills in the practice of medicine. In many states, physicians are required to participate in a prescribed number of hours of accredited CME activities to maintain their licenses to practice medicine. (*See also*: undergraduate medical education; graduate medical education.)

Continuity experience/clinic refers to an assigned educational experience that allows students to follow the same patients over a prolonged period of time.

Core clerkships. The word "core" refers to the six clerkships required by the Liaison Committee on Medical Education. These clerkships are in the disciplines of family medicine, internal medicine, obstetrics and gynecology, pediatrics, psychiatry, and surgery. (*See also*: clerkships; LCME.)

The **Curriculum Management and Information Tool (CurrMIT) database** is a national on-line database that medical schools can use to document and manage their curricula.

The **dean's tax** refers to the percentage of clinical revenue that clinical departments must contribute to the medical school under the provisions of a school's faculty practice plan.

Didactic instruction is the term used most often to refer to information conveyed through lectures. (*See also*: active learning.)

ERAS is the acronym for the Electronic Residency Application Service. ERAS uses the Internet to transmit residency applications and supporting credentials from medical schools to residency program directors. (*See also*: NRMP; the Match.)

Evidence-based medicine refers to the use, by physicians in practice, of diagnostic techniques, medications, and other therapies based on evidence supporting their effectiveness.

Faculty development refers to the professional development activities that are intended to improve the teaching and research skills of faculty.

Fifth Pathway is a program established in 1971 that allows students who have completed the full curriculum of a foreign medical school to enroll in a special one-year clinical program at participating U.S. medical schools to become eligible for a state licensing examination and admission to an accredited internship or residency.

Formative assessment refers to a process by which assessment of student performance leads to feedback intended to improve performance, rather than simply document that performance. (*See also*: summative assessment.)

A **generalist curriculum** consists of a group of learning experiences intended to orient students to the principles and practice of primary care medicine.

Graduate medical education is the formal training that physicians receive after graduation from medical school that prepares them for the practice of one of the specialties of medicine. Physicians train for three to seven years beyond medical school, depending on their specialty choices. (*See also*: undergraduate medical education; continuing medical education.)

History taking refers to the process by which physicians obtain from patients information that is needed to provide optimal medical care.

Horizontal integration of the curriculum refers to the integration of thematic or topic-specific content throughout a year of the curriculum without regard for the organization of individual courses. (*See also*: vertical integration of the curriculum.)

Humanism in medicine is the term that is used to acknowledge that, in caring for patients, physicians must be attentive to the non-biological dimensions of patients' illnesses.

Interdisciplinary refers to collaboration across disciplines.

Internship is a term that refers to the first year of graduate medical education. An intern is also a first-year resident.

LCME is the acronym for the Liaison Committee on Medical Education, the body jointly managed by the American Medical Association and the Association of American Medical Colleges that accredits allopathic medical schools in the United States and Canada.

The **Match** is the annual process managed by the National Resident Matching Program that uses a computerized algorithm to optimize the ranking choices of U.S. medical graduates who are seeking residency programs and the ranking choices of residency directors who are seeking graduates. (*See also*: NRMP.)

MedCareers refers to a program of the Association of American Medical Colleges designed to assist students in fully understanding their specialty options and in selecting and applying to residency programs that best suit their career objectives.

The **Medical School Objectives Project (MSOP)** is an initiative of the Association of American Medical Colleges that seeks to develop a consensus within the medical education community on the attributes (knowledge, skills, and attitudes) that medical students should possess at the time of graduation, to set forth learning objectives for the medical school curriculum based on those attributes, and to assist medical schools in implementing changes in their curricula that will ensure that students have opportunities to achieve those objectives.

Medline is an online database of articles published in peer-reviewed medical journals that can be searched to obtain references on specific topics.

Mission-based management/budgeting is a management approach that bases organizational decision making on a clear understanding of the organization's revenue streams and how those revenues might be allocated in support of the organization's mission.

NBME subject examinations (also called "shelf examinations") are discipline-specific examinations and comprehensive interdisciplinary examinations constructed by the National Board of Medical Examiners. These examinations are used to assess students' performances at the ends of courses or clerkships, or before taking the USMLE. (*See also*: USMLE.)

NRMP is the acronym for the National Residency Matching Program, a private, not-for-profit corporation that each year conducts "the Match" to optimize the rank-ordered choices of U.S. medical graduates and residency program directors. (*See also*: the Match.)

OSCE is the acronym for objective structured clinical examination, an assessment method that assesses in a structured and objective manner an examinee's performance of specified clinical tasks. Standardized patients are sometimes used to help carry out OSCEs.

Outpatients are patients who are cared for in venues other than a hospital inpatient unit. (*See also*: ambulatory setting.)

Population medicine comprises those activities that evaluate and manage the health needs of a specific population. "Population" may be defined as a geographic community, a patient panel (that population for whom a physician has health care responsibilities), or a group with a particular demographic characteristic or characteristics (e.g., age, gender, or economic, cultural, and/or educational status).

A **preceptorship** generally refers to a learning experience in which a student is assigned to spend a predetermined amount of time (e.g., an afternoon a week, a month, six weeks) with a practicing physician, observing and participating in the physician's practice activities.

Primary care refers to a pattern of medical practice in which a physician assumes responsibility for managing all of the routine medical problems of patients on a long-term, continuous basis.

Problem-based learning refers to a pedagogic approach in which a small group of students engage in self-directed learning aimed at gaining an understanding of the ways that the biological sciences and clinical disciplines can elucidate a specific scientific or clinical problem.

A **selective** is an elective course for which the options available to be selected are limited.

Service learning occurs in settings (generally community-based) where services are being provided.

Shelf examinations. (*See*: NBME subject examinations.)

A **standardized patient** (SP) is an individual who has been trained to portray the history, physical findings, and affect of an actual patient in a standardized way on a repeated basis. SPs are used for both the teaching and the assessment of students. An SP may be an actual patient or may be an actor.

A **subinternship** is an advanced clinical elective in which senior medical students assume many of the responsibilities generally held by first-year residents.

Summative assessment refers to an assessment of students' performances primarily for the purpose of reaching a decision about the overall quality of those performances. Comprehensive examinations, end-of-clerkship, and "end-of-year" examinations represent these assessments. (*See also*: formative assessment.)

Teaching portfolio refers to a collection of information about a faculty member's teaching activities that is used generally in making promotion and tenure decisions.

Two + two curriculum is a term that refers to the traditional organization of the medical school curriculum, in which the first two years are devoted almost exclusively to basic science education and the last two years are devoted almost exclusively to clinical education.

A **tutorial** is a pedagogic approach in which a tutor or facilitator guides a student's learning in individual or small-group sessions.

Undergraduate medical education refers to the four years of education that is conducted by medical schools and leads to the granting of the MD degree. (*See also*: graduate medical education; continuing medical education.)

USMLE is the acronym for the United States Medical Licensing Examination, a three-step examination for medical licensure in the United States. Step 1 focuses on knowledge of the basic sciences and is often taken at the end of the second year of medical school; Step 2 focuses on the knowledge and understanding necessary to give clinical care under supervision and is usually taken before graduation; and Step 3 focuses on the knowledge and understanding necessary for the unsupervised practice of medicine and is usually taken during or after the first year of residency training. (*See also*: basic sciences.)

Vertical integration of the curriculum refers to the integration of thematic or topic-specific content across the years of the curriculum without regard for the organization of individual courses. (*See also*: horizontal integration of the curriculum.)

—M. Brownell Anderson